TOSHIBA
Leading Innovation

FILE NO. A010-024

SERVICE MANUAL

AIR-CONDITIONER
SPLIT TYPE

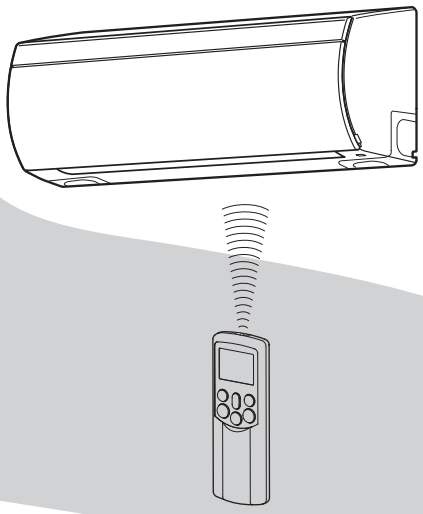
<Heat Pump Type>

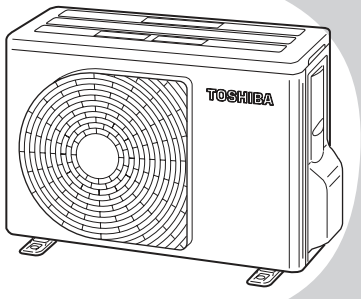
Indoor Unit

RAS-M10PKVP-E
RAS-M13PKVP-E
RAS-M16PKVP-E

Outdoor Unit

RAS-M18UAV-E





HFC
R410A

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CONTENTS

1. SAFETY PRECAUTIONS 3
2. SPECIFICATIONS 5
3. REFRIGERANT R410A 9
4. CONSTRUCTION VIEWS 17
5. WIRING DIAGRAM 19
6. SPECIFICATIONS OF ELECTRICAL PARTS 21
7. REFRIGERANT CYCLE DIAGRAM 22
8. CONTROL BLOCK DIAGRAM 24
9. OPERATION DESCRIPTION 26
10. INSTALLATION PROCEDURE 52
11. HOW TO DIAGNOSE THE TROUBLE 72
12. HOW TO REPLACE THE MAIN PARTS 94
13. EXPLODED VIEWS AND PARTS LIST 110

1. SAFETY PRECAUTIONS

For general public use

Power supply cord of outdoor unit shall be more than 1.5 mm ² (H07RN-F or 245IEC66) polychloroprene sheathed flexible cord.

- Read this “SAFETY PRECAUTIONS” carefully before servicing.
- The precautions described below include the important items regarding safety. Observe them without fail.
- After the servicing work, perform a trial operation to check for any problem.
- Turn off the main power supply switch (or breaker) before the unit maintenance.

CAUTION

New Refrigerant Air Conditioner Installation

- **THIS AIR CONDITIONER ADOPTS THE NEW HFC REFRIGERANT (R410A) WHICH DOES NOT DESTROY OZONE LAYER.**

R410A refrigerant is apt to be affected by impurities such as water, oxidizing membrane, and oils because the working pressure of R410A refrigerant is approx. 1.6 times of refrigerant R22.

Accompanied with the adoption of the new refrigerant, the refrigeration machine oil has also been changed. Therefore, during installation work, be sure that water, dust, former refrigerant, or refrigeration machine oil does not enter into the new type refrigerant R410A air conditioner circuit.

To prevent mixing of refrigerant or refrigerating machine oil, the sizes of connecting sections of charging port on main unit and installation tools are different from those used for the conventional refrigerant units.

Accordingly, special tools are required for the new refrigerant (R410A) units.

For connecting pipes, use new and clean piping materials with high pressure fittings made for R410A only, so that water and/or dust does not enter. Moreover, do not use the existing piping because there are some problems with pressure fittings and possible impurities in existing piping.

CAUTION

TO DISCONNECT THE APPLIANCE FROM THE MAIN POWER SUPPLY

This appliance must be connected to the main power supply by a circuit breaker or a switch with a contact separation of at least 3 mm.

DANGER

- **THE MANUFACTURER SHALL NOT ASSUME ANY LIABILITY FOR THE DAMAGE CAUSED BY NOT OBSERVING THE DESCRIPTION OF THIS MANUAL.**
- **ASK AN AUTHORIZED DEALER OR QUALIFIED INSTALLATION PROFESSIONAL TO INSTALL/ MAINTAIN THE AIR CONDITIONER.**

  INAPPROPRIATE SERVICING MAY RESULT IN WATER LEAKAGE, ELECTRIC SHOCK OR FIRE.
- TURN OFF MAIN POWER SUPPLY BEFORE ATTEMPTING ANY ELECTRICAL WORK. MAKE SURE ALL POWER SWITCHES ARE OFF. FAILURE TO DO SO MAY CAUSE ELECTRIC SHOCK.

  ⚠ DANGER: HIGH VOLTAGE

  The high voltage circuit is incorporated.

  Be careful to do the check service, as the electric shock may be caused in case of touching parts on the P.C. board by hand.
- CORRECTLY CONNECT THE CONNECTING CABLE. IF THE CONNECTING CABLE IS INCORRECTLY CONNECTED, ELECTRIC PARTS MAY BE DAMAGED.
- CHECK THAT THE EARTH WIRE IS NOT BROKEN OR DISCONNECTED BEFORE SERVICE AND INSTALLATION. FAILURE TO DO SO MAY CAUSE ELECTRIC SHOCK.

- DO NOT INSTALL NEAR CONCENTRATIONS OF COMBUSTIBLE GAS OR GAS VAPORS. FAILURE TO FOLLOW THIS INSTRUCTION CAN RESULT IN FIRE OR EXPLOSION.
- TO PREVENT THE INDOOR UNIT FROM OVERHEATING AND CAUSING A FIRE HAZARD, PLACE THE UNIT WELL AWAY (MORE THAN 2 M) FROM HEAT SOURCES SUCH AS RADIATORS, HEAT RESISTORS, FURNACE, STOVES, ETC.
- WHEN MOVING THE AIR-CONDITIONER FOR INSTALLATION IN ANOTHER PLACE, BE VERY CAREFUL NOT TO ALLOW THE SPECIFIED REFRIGERANT (R410A) TO BECOME MIXED WITH ANY OTHER GASEOUS BODY INTO THE REFRIGERATION CIRCUIT. IF AIR OR ANY OTHER GAS IS MIXED IN THE REFRIGERANT, THE GAS PRESSURE IN THE REFRIGERATION CIRCUIT WILL BECOME ABNORMALLY HIGH AND IT MAY RESULT IN THE PIPE BURSTING AND POSSIBLE PERSONNEL INJURIES.
- IN THE EVENT THAT THE REFRIGERANT GAS LEAKS OUT OF THE PIPE DURING THE SERVICE WORK AND THE INSTALLATION WORK, IMMEDIATELY LET FRESH AIR INTO THE ROOM. IF THE REFRIGERANT GAS IS HEATED, SUCH AS BY FIRE, GENERATION OF POISONOUS GAS MAY RESULT.

WARNING

- **Do not use any refrigerant different from the one specified for complement or replacement.**
  Otherwise, abnormally high pressure may be generated in the refrigeration cycle, which may result in a failure or explosion of the product or an injury to your body.
- **Never modify this unit by removing any of the safety guards or bypass any of the safety interlock switches.**
- **Do not install in a place which cannot bear the weight of the unit. Personal injury and property damage can result if the unit falls.**
- **After the installation work, confirm that refrigerant gas does not leak.**
  If refrigerant gas leaks into the room and flows near a fire source such as a cooking range, noxious gas may generate.
- **The electrical work must be performed by a qualified electrician in accordance with the Installation Manual. Make sure the air conditioner uses an exclusive circuit.**
  An insufficient circuit capacity or inappropriate installation may cause fire.
- **When wiring, use the specified cables and connect the terminals securely to prevent external forces applied to the cable from affecting the terminals.**
- **Be sure to provide grounding.**
  Do not connect ground wires to gas pipes, water pipes, lightning rods or ground wires for telephone cables.
- **Conform to the regulations of the local electric company when wiring the power supply.**
  Inappropriate grounding may cause electric shock.

CAUTION

- Exposure of unit to water or other moisture before installation may result in an electrical short. Do not store in a wet basement or expose to rain or water.
- Do not install in a place that can increase the vibration of the unit. Do not install in a place that can amplify the noise level of the unit or where noise or discharged air might disturb neighbors.
- To avoid personal injury, be careful when handling parts with sharp edges.
- **Perform the specified installation work to guard against an earthquake.**
  If the air conditioner is not installed appropriately, accidents may occur due to the falling unit.

For Reference:

If a heating operation would be continuously performed for a long time under the condition that the outdoor temperature is 0°C or lower, drainage of defrosted water may be difficult due to freezing of the bottom plate, resulting in a trouble of the cabinet or fan.

It is recommended to procure an antifreeze heater locally for a safe installation of the air conditioner.

For details, contact the dealer.

2. SPECIFICATIONS

The indoor and outdoor units that can be used in combination are shown in the tables below.

Table of models that can be connected

Type	Outdoor unit	Indoor unit			
Heat pump	RAS-M18UAV-E		RAS-M10PKVP-E	RAS-M13PKVP-E	RAS-M16PKVP-E
			RAS-M10PKVP-ND	RAS-M13PKVP-ND	RAS-M16PKVP-ND
			RAS-B10UFV-E	RAS-B13UFV-E	
		RAS-M07SKV-E	RAS-M10SKV-E	RAS-M13SKV-E	RAS-M16SKV-E
			RAS-M10GDV-E	RAS-M13GDV-E	RAS-M16GDV-E
			RAS-M10SMUV-E	RAS-M13SMUV-E	RAS-M16SMUV-E

Table of models that can be used in combination

Type	Outdoor unit	Combinations of indoor unit models that can be connected
Heat pump	RAS-M18UAV-E	07 + 07, 07 + 10, 07 + 13, 07 +16, 10 + 10, 10 + 13, 10 + 16, 13 + 13, 13+ 16

NOTES

A 1-room connection is not an option for the indoor units (you cannot connect only one indoor unit).
A 2-room connection must always be used for the indoor units (you must connect two indoor units).
With the RAS-M18UAV-E outdoor unit model, the 16 + 16 combination is not an option.

The contents noted in this service manual limit the indoor units to the RAS-M10PKVP-E, RAS-M13PKVP-E, RAS-M16PKVP-E.
For other indoor units that can also be used in combination, see the service manual of each indoor unit.

Indoor unit	File No.
RAS-M07SKV-E RAS-M10SKV-E RAS-M13SKV-E RAS-M16SKV-E	SVM-07034
RAS-M10GDV-E RAS-M13GDV-E RAS-M16GDV-E	A05-010
RAS-B10UFV-E RAS-B13UFV-E	SVM-10044
RAS-M10SMUV-E RAS-M13SMUV-E RAS-M16SMUV-E	A06-015

2-1. Specifications

<Heat Pump Models>

RAS-M10PKVP-E, RAS-M13PKVP-E, RAS-M16PKVP-E / RAS-M18UAV-E

Unit model	Indoor			**RAS-M10PKVP-E, RAS-M13PKVP-E, RAS-M16PKVP-E**		
	Outdoor			**RAS-M18UAV-E**		
Cooling capacity			(kW)	5.2		
Cooling capacity range			(kW)	1.4 – 6.2		
Heating capacity			(kW)	5.6		
Heating capacity range			(kW)	0.9 – 8.3		
Power supply				220–240 V – 1 Ph – 50Hz / 220 V – 1 Ph –60Hz		
Electric characteristics	Indoor (220V/230V/240V)	Unit model		**RAS-M10PKVP-E**	**RAS-M13PKVP-E**	**RAS-M16PKVP-E**
		Running current	(A)	0.21 / 0.20 / 0.19	0.24 / 0.23 / 0.22	0.27 / 0.26 / 0.25
		Power consumption	(W)	25	30	35
		Power factor	(%)	54 / 54 / 55	57 / 57 / 57	59 / 59 / 58
	Outdoor (220V/230V/240V)	Operation mode		**Cooling**		**Heating**
		Running current	(A)	7.12/6.80/6.50		8.28/7.91/7.57
		Power consumption	(W)	1540		1790
		Power factor	(%)	98		98
		Starting current	(A)	7.42/7.10/6.80		
COP (Cooling/Heating)				3.61/4.71		
Operating noise	Indoor (Cooling/Heating)	Unit model		**RAS-M10PKVP-E**	**RAS-M13PKVP-E**	**RAS-M16PKVP-E**
		High	(dB•A)	43 / 43	45 / 45	47 / 47
		Medium	(dB•A)	37 / 35	38 / 36	40 / 38
		Low	(dB•A)	31 / 27	31 / 27	34 / 30
	Outdoor (Cooling/Heating)	2 indoor units operating	(dB•A)	49/51		
Indoor unit	Unit model			**RAS-M10PKVP-E**	**RAS-M13PKVP-E**	**RAS-M16PKVP-E**
	Dimension	Height	(mm)	295	295	295
		Width	(mm)	790	790	790
		Depth	(mm)	242	242	242
	Net weight		(kg)	12	12	12
	Fan motor output		(W)	30	30	30
	Air flow rate	(Cooling/Heating)	(m³/h)	640 / 640	690 / 690	750 / 750
Outdoor unit	Dimension	Height	(mm)	550		
		Width	(mm)	780		
		Depth	(mm)	290		
	Net weight		(kg)	41		
	Compressor	Motor output	(W)	1100		
			Type	Twin rotary type with DC-inverter variable speed control		
			Model	DA130A1F-25F		
	Fan motor output		(W)	43		
	Air flow rate		(m³/h)	2300/2400		
	Type			Flare connection		
Piping connection	Indoor unit	Unit model		**RAS-M10PKVP-E**	**RAS-M13PKVP-E**	**RAS-M16PKVP-E**
		Liquid side/Gas side		Ø6.35/ Ø9.52	Ø6.35/ Ø9.52	Ø6.35/ Ø12.7
	Outdoor unit	Liquid side/Gas side		Ø6.35/ Ø9.52		
	Maximum length (per unit)		(m)	20		
	Maximum length (total)		(m)	30		
	Maximum chargeless length (total)		(m)	20		
	Maximum height difference		(m)	10		
	Additional refrigerant			20g/m (pipe length 21m to 30m)		
	Name of refrigerant			R410A		
	Weight		(kg)	1.20		
Wiring connection	Power supply			3 Wires : includes earth		
	Interconnection			4 Wires : includes earth		
Usable temperature range	Indoor	(Cooling/Heating)	(°C)	21 to 32/0 to 27		
	Outdoor	(Cooling/Heating)	(°C)	5 to 43/–15 to 24		
Accessory	Indoor unit	Unit model		**RAS-M10PKVP-E**	**RAS-M13PKVP-E**	**RAS-M16PKVP-E**
		Installation plate		1	1	1
		Wireless remote controller		1	1	1
		Batteries		2	2	2
		Remote controller holder		1	1	1
		Remote controller holder mounting screw		2 (Ø3.1 × 16L)	2 (Ø3.1 × 16L)	2 (Ø3.1 × 16L)
		Owner's manual		1	1	1
		Mounting screw		6 (Ø4 × 25L)	6 (Ø4 × 25L)	6 (Ø4 × 25L)
		Installation manual		1	1	1
	Outdoor unit	Installation manual		1		
		Drain nipple		1		
		Water-proof rubber cap		2		

- For performance when each indoor unit is combined with other unit, refer to the separate table.
- The specifications may be subject to change without notice for purpose of improvement.

2-2. Performance Specifications Combinations of Indoor Unit

<Cooling> RAS-M18UAV-E

Operation mode	Volts V	Operation status	Operating indoor unit A	Operating indoor unit B	Unit capacity (kW) A	Unit capacity (kW) B	Capacity kW	Running current A	Power Consumption W
Cooling	220	1 unit	07	—	2.0	—	2.0 (1.1 to 3.0)	2.40 (1.43 to 3.83)	460 (220 to 800)
			10	—	2.7	—	2.7 (1.1 to 3.2)	3.25 (1.43 to 3.83)	630 (220 to 800)
			13	—	3.7	—	3.7 (1.1 to 4.2)	5.21 (1.43 to 6.49)	1100 (220 to 1400)
			16	—	4.5	—	4.5 (1.1 to 4.9)	7.03 (1.43 to 7.88)	1500 (220 to 1700)
		2 units	07	07	2.00	2.00	4.0 (1.4 to 4.8)	4.69 (1.68 to 9.97)	960 (260 to 2150)
			10	07	2.65	1.95	4.6 (1.4 to 6.0)	5.87 (1.68 to 9.97)	1200 (260 to 2150)
			10	10	2.55	2.55	5.1 (1.4 to 6.1)	6.75 (1.68 to 9.97)	1410 (260 to 2150)
			13	07	3.38	1.82	5.2 (1.4 to 6.1)	6.75 (1.68 to 10.06)	1440 (260 to 2170)
			13	10	3.00	2.20	5.2 (1.4 to 6.2)	6.75 (1.68 to 10.06)	1440 (260 to 2170)
			16	07	3.60	1.60	5.2 (1.4 to 6.2)	6.75 (1.68 to 10.06)	1440 (260 to 2170)
			16	10	3.25	1.95	5.2 (1.4 to 6.2)	6.75 (1.68 to 10.06)	1440 (260 to 2170)
			13	13	2.60	2.60	5.2 (1.4 to 6.2)	6.75 (1.68 to 10.06)	1440 (260 to 2170)
			16	13	2.85	2.35	5.2 (1.4 to 6.2)	6.75 (1.68 to 10.06)	1440 (260 to 2170)
	230	1 unit	07	—	2.0	—	2.0 (1.1 to 3.0)	2.30 (1.37 to 3.66)	460 (220 to 800)
			10	—	2.7	—	2.7 (1.1 to 3.2)	3.10 (1.37 to 3.66)	630 (220 to 800)
			13	—	3.7	—	3.7 (1.1 to 4.2)	5.00 (1.37 to 6.21)	1100 (220 to 1400)
			16	—	4.5	—	4.5 (1.1 to 4.9)	6.70 (1.37 to 7.23)	1500 (220 to 1700)
		2 units	07	07	2.00	2.00	4.0 (1.4 to 4.8)	4.50 (1.61 to 9.54)	960 (260 to 2150)
			10	07	2.65	1.95	4.6 (1.4 to 6.0)	5.61 (1.61 to 9.54)	1200 (260 to 2150)
			10	10	2.55	2.55	5.1 (1.4 to 6.1)	6.45 (1.61 to 9.54)	1410 (260 to 2150)
			13	07	3.38	1.82	5.2 (1.4 to 6.1)	6.45 (1.61 to 9.63)	1440 (260 to 2170)
			13	10	3.00	2.20	5.2 (1.4 to 6.2)	6.45 (1.61 to 9.63)	1440 (260 to 2170)
			16	07	3.60	1.60	5.2 (1.4 to 6.2)	6.45 (1.61 to 9.63)	1440 (260 to 2170)
			16	10	3.25	1.95	5.2 (1.4 to 6.2)	6.45 (1.61 to 9.63)	1440 (260 to 2170)
			13	13	2.60	2.60	5.2 (1.4 to 6.2)	6.45 (1.61 to 9.63)	1440 (260 to 2170)
			16	13	2.85	2.35	5.2 (1.4 to 6.2)	6.45 (1.61 to 9.63)	1440 (260 to 2170)
	240	1 unit	07	—	2.0	—	2.0 (1.1 to 3.0)	2.20 (1.31 to 3.51)	460 (220 to 800)
			10	—	2.7	—	2.7 (1.1 to 3.2)	2.98 (1.31 to 3.51)	630 (220 to 800)
			13	—	3.7	—	3.7 (1.1 to 4.2)	4.77 (1.31 to 5.95)	1100 (220 to 1400)
			16	—	4.5	—	4.5 (1.1 to 4.9)	6.44 (1.31 to 7.23)	1500 (220 to 1700)
		2 units	07	07	2.00	2.00	4.0 (1.4 to 4.8)	4.30 (1.55 to 9.14)	960 (260 to 2150)
			10	07	2.65	1.95	4.6 (1.4 to 6.0)	5.38 (1.55 to 9.14)	1200 (260 to 2150)
			10	10	2.55	2.55	5.1 (1.4 to 6.1)	6.18 (1.55 to 9.14)	1410 (260 to 2150)
			13	07	3.38	1.82	5.2 (1.4 to 6.1)	6.19 (1.55 to 9.23)	1440 (260 to 2170)
			13	10	3.00	2.20	5.2 (1.4 to 6.2)	6.19 (1.55 to 9.23)	1440 (260 to 2170)
			16	07	3.60	1.60	5.2 (1.4 to 6.2)	6.19 (1.55 to 9.23)	1440 (260 to 2170)
			16	10	3.25	1.95	5.2 (1.4 to 6.2)	6.19 (1.55 to 9.23)	1440 (260 to 2170)
			13	13	2.60	2.60	5.2 (1.4 to 6.2)	6.19 (1.55 to 9.23)	1440 (260 to 2170)
			16	13	2.85	2.35	5.2 (1.4 to 6.2)	6.19 (1.55 to 9.23)	1440 (260 to 2170)

<Heating> RAS-M18UAV-E

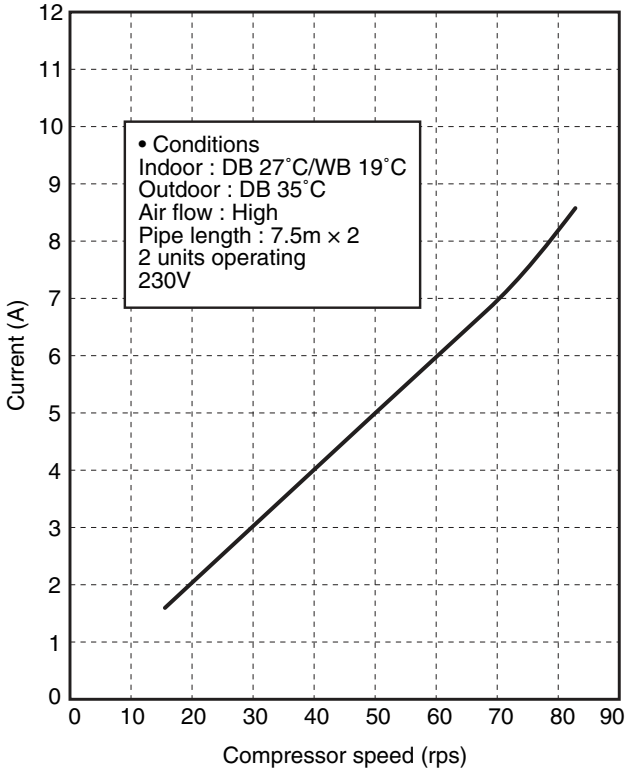
Operation mode	Volts V	Operation status	Operating indoor unit A	Operating indoor unit B	Unit capacity (kW) A	Unit capacity (kW) B	Capacity kW	Running current A	Power Consumption W
Heating	220	1 unit	07	—	2.7	—	2.7 (0.7 to 4.8)	3.65 (1.10 to 7.88)	730 (170 to 1700)
			10	—	4.0	—	4.0 (0.7 to 5.2)	5.62 (1.10 to 7.88)	1200 (170 to 1700)
			13	—	5.0	—	5.0 (0.7 to 6.5)	8.43 (1.10 to 11.73)	1800 (170 to 2530)
			16	—	5.5	—	5.5 (0.7 to 6.9)	8.90 (1.10 to 11.73)	1900 (170 to 2530)
		2 units	07	07	2.70	2.70	5.4 (0.9 to 8.0)	5.58 (1.30 to 11.62)	1190 (200 to 2480)
			10	07	3.79	1.61	5.4 (0.9 to 8.2)	5.58 (1.30 to 11.73)	1190 (200 to 2530)
			10	10	2.70	2.70	5.4 (0.9 to 8.2)	5.58 (1.30 to 11.73)	1190 (200 to 2530)
			13	07	3.64	1.96	5.6 (0.9 to 8.2)	5.58 (1.30 to 11.73)	1190 (200 to 2530)
			13	10	3.11	2.49	5.6 (0.9 to 8.3)	5.58 (1.30 to 11.73)	1190 (200 to 2530)
			16	07	3.76	1.84	5.6 (0.9 to 8.3)	5.58 (1.30 to 11.73)	1190 (200 to 2530)
			16	10	3.24	2.36	5.6 (0.9 to 8.3)	5.58 (1.30 to 11.73)	1190 (200 to 2530)
			13	13	2.80	2.80	5.6 (0.9 to 8.3)	5.58 (1.30 to 11.73)	1190 (200 to 2530)
			16	13	2.93	2.67	5.6 (0.9 to 8.3)	5.58 (1.30 to 11.73)	1190 (200 to 2530)
	230	1 unit	07	—	2.7	—	2.7 (0.7 to 4.8)	3.50 (1.06 to 7.54)	730 (170 to 1700)
			10	—	4.0	—	4.0 (0.7 to 5.2)	5.40 (1.06 to 7.54)	1200 (170 to 1700)
			13	—	5.0	—	5.0 (0.7 to 6.5)	8.10 (1.06 to 11.22)	1800 (170 to 2530)
			16	—	5.5	—	5.5 (0.7 to 6.9)	8.50 (1.06 to 11.22)	1900 (170 to 2530)
		2 units	07	07	2.70	2.70	5.4 (0.9 to 8.0)	5.35 (1.24 to 11.12)	1190 (200 to 2480)
			10	07	3.79	1.61	5.4 (0.9 to 8.2)	5.35 (1.24 to 11.22)	1190 (200 to 2530)
			10	10	2.70	2.70	5.4 (0.9 to 8.2)	5.35 (1.24 to 11.22)	1190 (200 to 2530)
			13	07	3.64	1.96	5.6 (0.9 to 8.2)	5.35 (1.24 to 11.22)	1190 (200 to 2530)
			13	10	3.11	2.49	5.6 (0.9 to 8.3)	5.35 (1.24 to 11.22)	1190 (200 to 2530)
			16	07	3.76	1.84	5.6 (0.9 to 8.3)	5.35 (1.24 to 11.22)	1190 (200 to 2530)
			16	10	3.24	2.36	5.6 (0.9 to 8.3)	5.35 (1.24 to 11.22)	1190 (200 to 2530)
			13	13	2.80	2.80	5.6 (0.9 to 8.3)	5.35 (1.24 to 11.22)	1190 (200 to 2530)
			16	13	2.93	2.67	5.6 (0.9 to 8.3)	5.35 (1.24 to 11.22)	1190 (200 to 2530)
	240	1 unit	07	—	2.7	—	2.7 (0.7 to 4.8)	3.34 (1.01 to 7.23)	730 (170 to 1700)
			10	—	4.0	—	4.0 (0.7 to 5.2)	5.15 (1.01 to 7.23)	1200 (170 to 1700)
			13	—	5.0	—	5.0 (0.7 to 6.5)	7.73 (1.01 to 10.76)	1800 (170 to 2530)
			16	—	5.5	—	5.5 (0.7 to 6.9)	8.16 (1.01 to 10.76)	1900 (170 to 2530)
		2 units	07	07	2.70	2.70	5.4 (0.9 to 8.0)	5.11 (1.19 to 10.65)	1190 (200 to 2480)
			10	07	3.79	1.61	5.4 (0.9 to 8.2)	5.11 (1.19 to 10.76)	1190 (200 to 2530)
			10	10	2.70	2.70	5.4 (0.9 to 8.2)	5.11 (1.19 to 10.76)	1190 (200 to 2530)
			13	07	3.64	1.96	5.6 (0.9 to 8.2)	5.11 (1.19 to 10.76)	1190 (200 to 2530)
			13	10	3.11	2.49	5.6 (0.9 to 8.3)	5.11 (1.19 to 10.76)	1190 (200 to 2530)
			16	07	3.76	1.84	5.6 (0.9 to 8.3)	5.11 (1.19 to 10.76)	1190 (200 to 2530)
			16	10	3.24	2.36	5.6 (0.9 to 8.3)	5.11 (1.19 to 10.76)	1190 (200 to 2530)
			13	13	2.80	2.80	5.6 (0.9 to 8.3)	5.11 (1.19 to 10.76)	1190 (200 to 2530)
			16	13	2.93	2.67	5.6 (0.9 to 8.3)	5.11 (1.19 to 10.76)	1190 (200 to 2530)

The above specification values are those under the conditions. Cooling Indoor: DB/WB=27/19°C Heating Indoor: DB=20°C
Outdoor: DB=35°C Outdoor: DB/WB=7/6°C

2-2-1 Operation Characteristic Curve

RAS-M18UAV-E

<Cooling>



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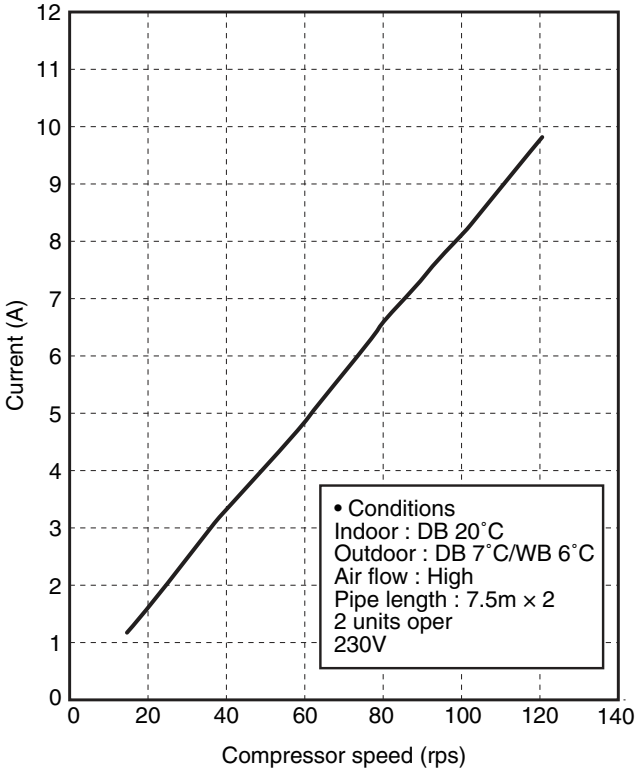

2-2-2 Capacity Variation Ratio According to Temperature

RAS-M18UAV-E

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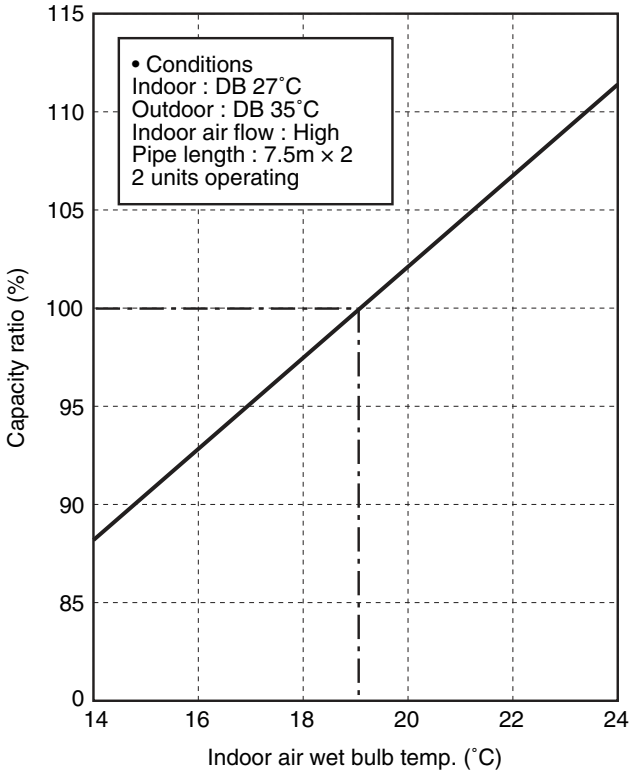
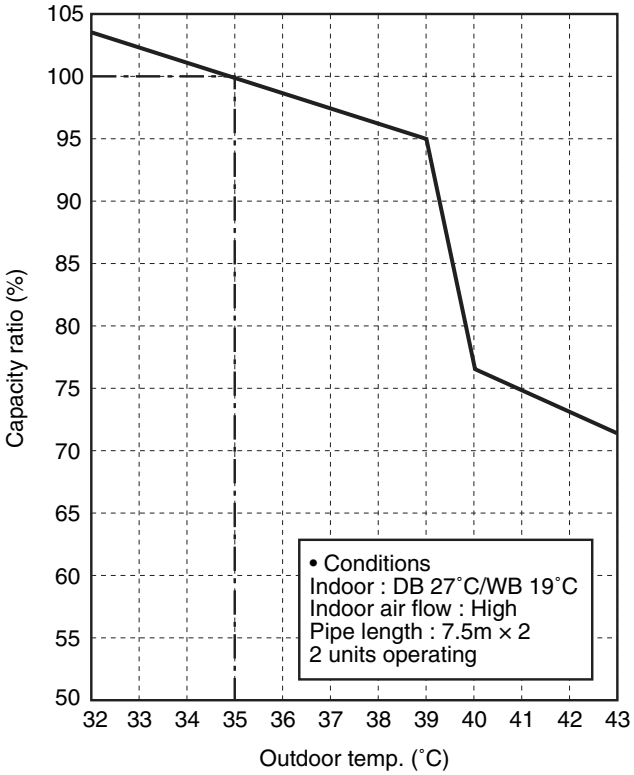

• Conditions
Indoor : DB 27˚C
Outdoor : DB 35˚C
Indoor air flow : High
Pipe length : 7.5m × 2
2 units operating
Capacity ratio (%)
Indoor air wet bulb temp. (˚C)

<Cooling>



∗ Capacity ratio : 100% = 5.2 kW

3. REFRIGERANT R410A

This air conditioner adopts the new refrigerant HFC (R410A) which does not damage the ozone layer.

The working pressure of the new refrigerant R410A is 1.6 times higher than conventional refrigerant (R22). The refrigerating oil is also changed in accordance with change of refrigerant, so be careful that water, dust, and existing refrigerant or refrigerating oil are not entered in the refrigerant cycle of the air conditioner using the new refrigerant during installation work or servicing time.

The next section describes the precautions for air conditioner using the new refrigerant.

Conforming to contents of the next section together with the general cautions included in this manual, perform the correct and safe work.

3-1. Safety During Installation/Servicing

As R410A's pressure is about 1.6 times higher than that of R22, improper installation/servicing may cause a serious trouble.

By using tools and materials exclusive for R410A, it is necessary to carry out installation/servicing safely while taking the following precautions into consideration.

1. Never use refrigerant other than R410A in an air conditioner which is designed to operate with R410A.

   If other refrigerant than R410A is mixed, pressure in the refrigeration cycle becomes abnormally high, and it may cause personal injury, etc. by a rupture.
2. Confirm the used refrigerant name, and use tools and materials exclusive for the refrigerant R410A.

   The refrigerant name R410A is indicated on the visible place of the outdoor unit of the air conditioner using R410A as refrigerant. To prevent mischarging, the diameter of the service port differs from that of R22.
3. If a refrigeration gas leakage occurs during installation/servicing, be sure to ventilate fully.

   If the refrigerant gas comes into contact with fire, a poisonous gas may occur.
4. When installing or removing an air conditioner, do not allow air or moisture to remain in the refrigeration cycle.

   Otherwise, pressure in the refrigeration cycle may become abnormally high so that a rupture or personal injury may be caused.
5. After completion of installation work, check to make sure that there is no refrigeration gas leakage.

   If the refrigerant gas leaks into the room, coming into contact with fire in the fan-driven heater, space heater, etc., a poisonous gas may occur.
6. When an air conditioning system charged with a large volume of refrigerant is installed in a small room, it is necessary to exercise care so that, even when refrigerant leaks, its concentration does not exceed the marginal level.

   If the refrigerant gas leakage occurs and its concentration exceeds the marginal level, an oxygen starvation accident may result.
7. Be sure to carry out installation or removal according to the installation manual.

   Improper installation may cause refrigeration trouble, water leakage, electric shock, fire, etc.
8. Unauthorized modifications to the air conditioner may be dangerous.

   If a breakdown occurs please call a qualified air conditioner technician or electrician.

   Improper repair may result in water leakage, electric shock and fire, etc.

3-2. Refrigerant Piping Installation

3-2-1. Piping Materials and Joints Used

For the refrigerant piping installation, copper pipes and joints are mainly used.

Copper pipes and joints suitable for the refrigerant must be chosen and installed.

Furthermore, it is necessary to use clean copper pipes and joints whose interior surfaces are less affected by contaminants.

1. Copper Pipes

It is necessary to use seamless copper pipes which are made of either copper or copper alloy and it is desirable that the amount of residual oil is less than 40 mg/10 m.

Do not use copper pipes having a collapsed, deformed or discolored portion (especially on the interior surface).

Otherwise, the expansion valve or capillary tube may become blocked with contaminants.

As an air conditioner using R410A incurs pressure higher than when using R22, it is necessary to choose adequate materials.

Thicknesses of copper pipes used with R410A are as shown in Table 3-2-1.

Never use copper pipes thinner than 0.8 mm even when it is available on the market.

Table 3-2-1 Thicknesses of annealed copper pipes

		Thickness (mm)	
Nominal diameter	**Outer diameter (mm)**	**R410A**	**R22**
1/4	6.35	0.80	0.80
3/8	9.52	0.80	0.80
1/2	12.70	0.80	0.80
5/8	15.88	1.00	1.00

2. Joints

For copper pipes, flare joints or socket joints are used. Prior to use, be sure to remove all contaminants.

a) Flare Joints

Flare joints used to connect the copper pipes cannot be used for pipings whose outer diameter exceeds 20 mm. In such a case, socket joints can be used.

Sizes of flare pipe ends, flare joint ends and flare nuts are as shown in Tables 3-2-3 to 3-2-6 below.

b) Socket Joints

Socket joints are such that they are brazed for connections, and used mainly for thick pipings whose diameter is larger than 20 mm.

Thicknesses of socket joints are as shown in Table 3-2-2.

Table 3-2-2 Minimum thicknesses of socket joints

Nominal diameter	Reference outer diameter of copper pipe jointed (mm)	Minimum joint thickness (mm)
1/4	6.35	0.50
3/8	9.52	0.60
1/2	12.70	0.70
5/8	15.88	0.80

3-2-2. Processing of Piping Materials

When performing the refrigerant piping installation, care should be taken to ensure that water or dust does not enter the pipe interior, that no other oil than lubricating oils used in the installed air-water heat pump is used, and that refrigerant does not leak.

When using lubricating oils in the piping processing, use such lubricating oils whose water content has been removed. When stored, be sure to seal the container with an airtight cap or any other cover.

1. Flare processing procedures and precautions

a) Cutting the Pipe

By means of a pipe cutter, slowly cut the pipe so that it is not deformed.

b) Removing Burrs and Chips

If the flared section has chips or burrs, refrigerant leakage may occur.

Carefully remove all burrs and clean the cut surface before installation.

c) Insertion of Flare Nut

d) Flare Processing

Make certain that a clamp bar and copper pipe have been cleaned.

By means of the clamp bar, perform the flare processing correctly.

Use either a flare tool for R410A or conventional flare tool.

Flare processing dimensions differ according to the type of flare tool. When using a conventional flare tool, be sure to secure “dimension A” by using a gauge for size adjustment.

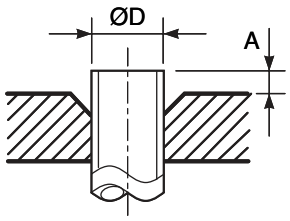


Fig. 3-2-1 Flare processing dimensions

Table 3-2-3 Dimensions related to flare processing for R410A

Nominal diameter	Outer diameter (mm)	Thickness (mm)	A (mm)		
			Flare tool for R410A clutch type	Conventional flare tool	
				Clutch type	Wing nut type
1/4	6.35	0.8	0 to 0.5	1.0 to 1.5	1.5 to 2.0
3/8	9.52	0.8	0 to 0.5	1.0 to 1.5	1.5 to 2.0
1/2	12.70	0.8	0 to 0.5	1.0 to 1.5	2.0 to 2.5
5/8	15.88	1.0	0 to 0.5	1.0 to 1.5	2.0 to 2.5

Table 3-2-4 Dimensions related to flare processing for R22

Nominal diameter	Outer diameter (mm)	Thickness (mm)	A (mm)		
			Flare tool for R22 clutch type	Conventional flare tool	
				Clutch type	Wing nut type
1/4	6.35	0.8	0 to 0.5	0.5 to 1.0	1.0 to 1.5
3/8	9.52	0.8	0 to 0.5	0.5 to 1.0	1.0 to 1.5
1/2	12.70	0.8	0 to 0.5	0.5 to 1.0	1.5 to 2.0
5/8	15.88	1.0	0 to 0.5	0.5 to 1.0	1.5 to 2.0

Table 3-2-5 Flare and flare nut dimensions for R410A

Nominal diameter	Outer diameter (mm)	Thickness (mm)	Dimension (mm)				Flare nut width (mm)
			A	B	C	D	
1/4	6.35	0.8	9.1	9.2	6.5	13	17
3/8	9.52	0.8	13.2	13.5	9.7	20	22
1/2	12.70	0.8	16.6	16.0	12.9	23	26
5/8	15.88	1.0	19.7	19.0	16.0	25	29

Table 3-2-6 Flare and flare nut dimensions for R22

Nominal diameter	Outer diameter (mm)	Thickness (mm)	Dimension (mm)				Flare nut width (mm)
			A	B	C	D	
1/4	6.35	0.8	9.1	9.2	6.5	13	17
3/8	9.52	0.8	13.0	13.5	9.7	20	22
1/2	12.70	0.8	16.2	16.0	12.9	20	24
5/8	15.88	1.0	19.7	19.0	16.0	23	27
3/4	19.05	1.0	23.3	24.0	19.2	34	36

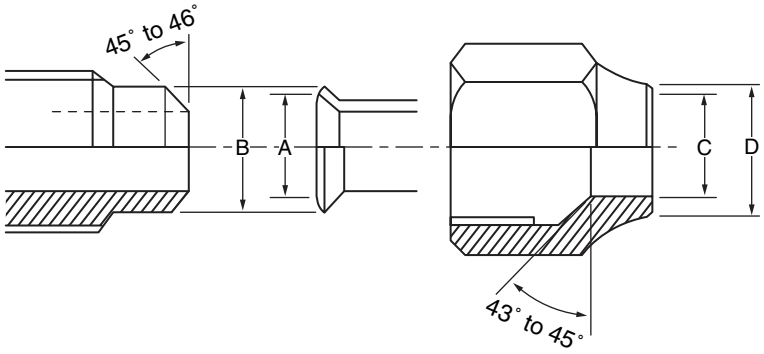


Fig. 3-2-2 Relations between flare nut and flare seal surface

2. Flare Connecting Procedures and Precautions

a) Make sure that the flare and union portions do not have any scar or dust, etc.

b) Correctly align the processed flare surface with the union axis.

c) Tighten the flare with designated torque by means of a torque wrench. The tightening torque for R410A is the same as that for conventional R22. Incidentally, when the torque is weak, the gas leakage may occur.

When it is strong, the flare nut may crack and may be made non-removable. When choosing the tightening torque, comply with values designated by manufacturers. Table 3-2-7 shows reference values.

NOTE :

When applying oil to the flare surface, be sure to use oil designated by the manufacturer.
If any other oil is used, the lubricating oils may deteriorate and cause the compressor to burn out.

Table 3-2-7 Tightening torque of flare for R410A [Reference values]

Nominal diameter	Outer diameter (mm)	Tightening torque N•m (kgf•cm)	Tightening torque of torque wrenches available on the market N•m (kgf•cm)
1/4	6.35	14 to 18 (140 to 180)	16 (160), 18 (180)
3/8	9.52	33 to 42 (330 to 420)	42 (420)
1/2	12.70	50 to 62 (500 to 620)	55 (550)
5/8	15.88	63 to 77 (630 to 770)	65 (650)

3-3.Tools

3-3-1. Required Tools

The service port diameter of packed valve of the outdoor unit in the air-water heat pump using R410A is changed to prevent mixing of other refrigerant.

To reinforce the pressure-resisting strength, flare processing dimensions and opposite side dimension of flare nut (For Ø12.7 copper pipe) of the refrigerant piping are lengthened.

The used refrigerating oil is changed, and mixing of oil may cause a trouble such as generation of sludge, clogging of capillary, etc. Accordingly, the tools to be used are classified into the following three types.

1. Tools exclusive for R410A (Those which cannot be used for conventional refrigerant (R22))
2. Tools exclusive for R410A, but can be also used for conventional refrigerant (R22)
3. Tools commonly used for R410A and for conventional refrigerant (R22)

The table below shows the tools exclusive for R410A and their interchangeability.

Tools exclusive for R410A (The following tools for R410A are required.)

Tools whose specifications are changed for R410A and their interchangeability

No.	Used tool	Usage	R410A air-water heat pump installation		Conventional air-water heat pump installation
			Existence of new equipment for R410A	Whether conventional equipment can be used	Whether new equipment can be used with conventional refrigerant
1	Flare tool	Pipe flaring	Yes	***(Note 1)**	○
2	Copper pipe gauge for adjusting projection margin	Flaring by conventional flare tool	Yes	***(Note 1)**	***(Note 1)**
3	Torque wrench (For Ø12.7)	Connection of flare nut	Yes	×	×
4	Gauge manifold	Evacuating, refrigerant charge, run check, etc.	Yes	×	×
5	Charge hose				
6	Vacuum pump adapter	Vacuum evacuating	Yes	×	○
7	Electronic balance for refrigerant charging	Refrigerant charge	Yes	×	○
8	Refrigerant cylinder	Refrigerant charge	Yes	×	×
9	Leakage detector	Gas leakage check	Yes	×	○
10	Charging cylinder	Refrigerant charge	**(Note 2)**	×	×

(Note 1) When flaring is carried out for R410A using the conventional flare tools, adjustment of projection margin is necessary. For this adjustment, a copper pipe gauge, etc. are necessary.

(Note 2) Charging cylinder for R410A is being currently developed.

General tools (Conventional tools can be used.)

In addition to the above exclusive tools, the following equipments which serve also for R22 are necessary as the general tools.

1. Vacuum pump
   Use vacuum pump by attaching vacuum pump adapter.
2. Torque wrench (For Ø6.35, Ø9.52)
3. Pipe cutter
4. Reamer
5. Pipe bender
6. Level vial
7. Screwdriver (+, –)
8. Spanner or Monkey wrench
9. Hole core drill (Ø65)
10. Hexagon wrench (Opposite side 4mm)
11. Tape measure
12. Metal saw

Also prepare the following equipments for other installation method and run check.

1. Clamp meter
2. Thermometer
3. Insulation resistance tester
4. Electroscope

3-4. Recharging of Refrigerant

When it is necessary to recharge refrigerant, charge the specified amount of new refrigerant according to the following steps.

Recover the refrigerant, and check no refrigerant remains in the equipment.

↓

Connect the charge hose to packed valve service port at the outdoor unit's gas side.

↓

Connect the charge hose to the vacuum pump adapter.

↓

Open fully both packed valves at liquid and gas sides.

↓

Place the handle of the gauge manifold Low in the fully opened position, and turn on the vacuum pump's power switch. Then, evacuating the refrigerant in the cycle.

↓

When the compound gauge's pointer has indicated –0.1 Mpa (–76 cmHg), place the handle Low in the fully closed position, and turn off the vacuum pump's power switch.

↓

Keep the status as it is for 1 to 2 minutes, and ensure that the compound gauge's pointer does not return.

↓

Set the refrigerant cylinder to the electronic balance, connect the connecting hose to the cylinder and the connecting port of the electronic balance, and charge **liquid refrigerant**.

(For refrigerant charging, see the figure below.)

1. Never charge refrigerant exceeding the specified amount.
2. If the specified amount of refrigerant cannot be charged, charge refrigerant **bit by bit** in COOL mode.
3. Do not carry out additional charging.
   When additional charging is carried out if refrigerant leaks, the refrigerant composition changes in the refrigeration cycle, that is characteristics of the air conditioner changes, refrigerant exceeding the specified amount is charged, and working pressure in the refrigeration cycle becomes abnormally high pressure, and may cause a rupture or personal injury.

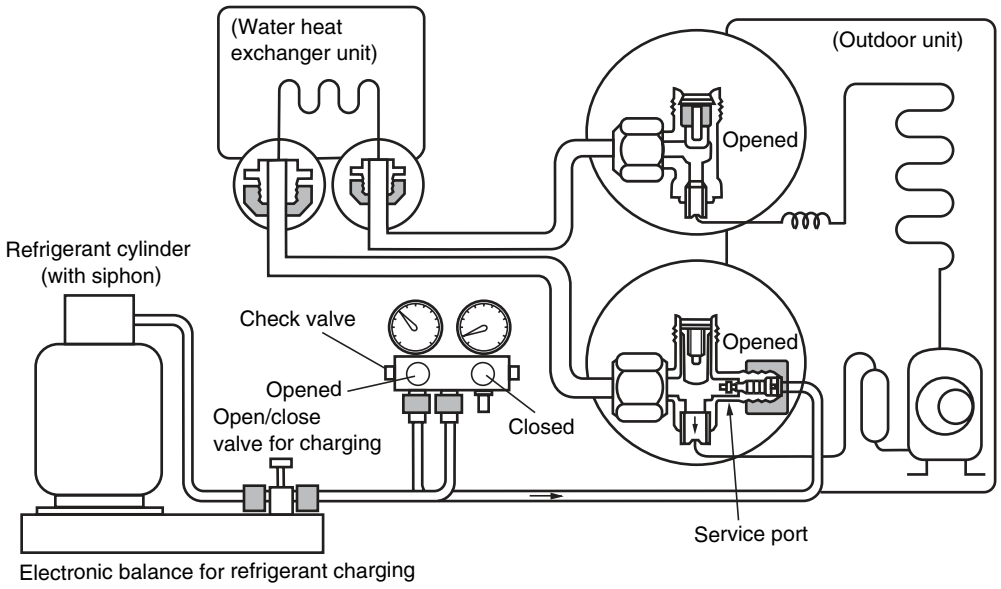
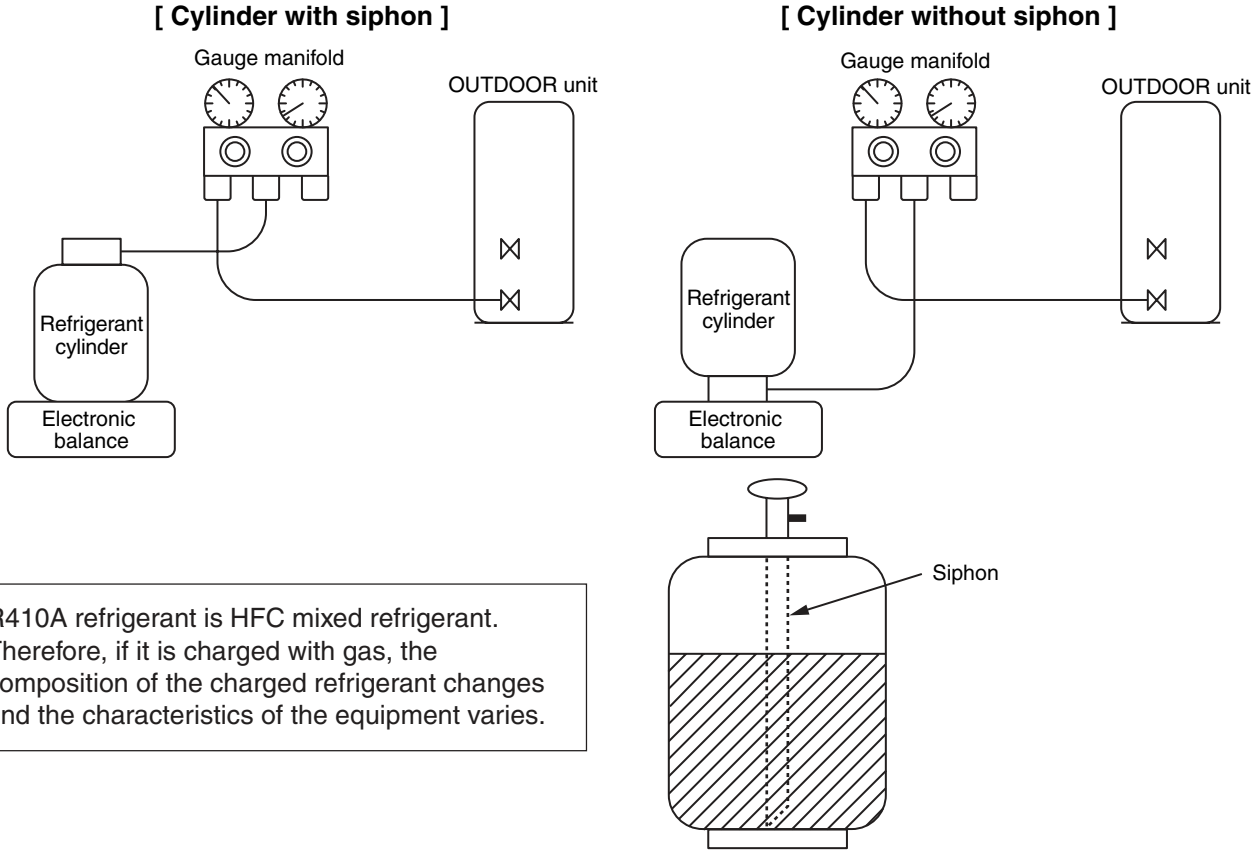


Fig. 3-4-1 Configuration of refrigerant charging

1. Be sure to make setting so that **liquid** can be charged.
2. When using a cylinder equipped with a siphon, liquid can be charged without turning it upside down.

It is necessary for charging refrigerant under condition of liquid because R410A is mixed type of refrigerant. Accordingly, when charging refrigerant from the refrigerant cylinder to the equipment, charge it turning the cylinder upside down if cylinder is not equipped with siphon.



R410A refrigerant is HFC mixed refrigerant. Therefore, if it is charged with gas, the composition of the charged refrigerant changes and the characteristics of the equipment varies.

Fig. 3-4-2

3-5. Brazing of Pipes

3-5-1. Materials for Brazing

1. Silver brazing filler

Silver brazing filler is an alloy mainly composed of silver and copper. It is used to join iron, copper or copper alloy, and is relatively expensive though it excels in solderability.

2. Phosphor bronze brazing filler

Phosphor bronze brazing filler is generally used to join copper or copper alloy.

3. Low temperature brazing filler

Low temperature brazing filler is generally called solder, and is an alloy of tin and lead. Since it is weak in adhesive strength, do not use it for refrigerant pipes

1. Phosphor bronze brazing filler tends to react with sulfur and produce a fragile compound water solution, which may cause a gas leakage. Therefore, use any other type of brazing filler at a hot spring resort, etc., and coat the surface with a paint.
2. When performing brazing again at time of servicing, use the same type of brazing filler.

3-5-2. Flux

1. Reason why flux is necessary

- By removing the oxide film and any foreign matter on the metal surface, it assists the flow of brazing filler.
- In the brazing process, it prevents the metal surface from being oxidized.
- By reducing the brazing filler's surface tension, the brazing filler adheres better to the treated metal.

2. Characteristics required for flux

- Activated temperature of flux coincides with the brazing temperature.
- Due to a wide effective temperature range, flux is hard to carbonize.
- It is easy to remove slag after brazing.
- The corrosive action to the treated metal and brazing filler is minimum.
- It excels in coating performance and is harmless to the human body.

As the flux works in a complicated manner as described above, it is necessary to select an adequate type of flux according to the type and shape of treated metal, type of brazing filler and brazing method, etc.

3. Types of flux

- **Noncorrosive flux**

  Generally, it is a compound of borax and boric acid.

  It is effective in case where the brazing temperature is higher than 800°C.

- **Activated flux**

  Most of fluxes generally used for silver brazing are this type.

  It features an increased oxide film removing capability due to the addition of compounds such as potassium fluoride, potassium chloride and sodium fluoride to the borax-boric acid compound.

4. Piping materials for brazing and used brazing filler/flux

Piping material	Used brazing filler	Used flux
Copper - Copper	Phosphor copper	Do not use
Copper - Iron	Silver	Paste flux
Iron - Iron	Silver	Vapor flux

1. Do not enter flux into the refrigeration cycle.
2. When chlorine contained in the flux remains within the pipe, the lubricating oil deteriorates.

   Therefore, use a flux which does not contain chlorine.
3. When adding water to the flux, use water which does not contain chlorine (e.g. distilled water or ion-exchange water).
4. Remove the flux after brazing.

3-5-3. Brazing

As brazing work requires sophisticated techniques, experiences based upon a theoretical knowledge, it must be performed by a person qualified.

In order to prevent the oxide film from occurring in the pipe interior during brazing, it is effective to proceed with brazing while letting dry Nitrogen gas (N2) flow.

Never use gas other than Nitrogen gas.

1. Brazing method to prevent oxidation

1) Attach a reducing valve and a flow-meter to the Nitrogen gas cylinder.
2) Use a copper pipe to direct the piping material, and attach a flow-meter to the cylinder.
3) Apply a seal onto the clearance between the piping material and inserted copper pipe for Nitrogen in order to prevent back flow of the Nitrogen gas.
4) When the Nitrogen gas is flowing, be sure to keep the piping end open.
5) Adjust the flow rate of Nitrogen gas so that it is lower than 0.05 m^3/Hr or 0.02 MPa (0.2kgf/cm^2) by means of the reducing valve.
6) After performing the steps above, keep the Nitrogen gas flowing until the pipe cools down to a certain extent (temperature at which pipes are touchable with hands).
7) Remove the flux completely after brazing.

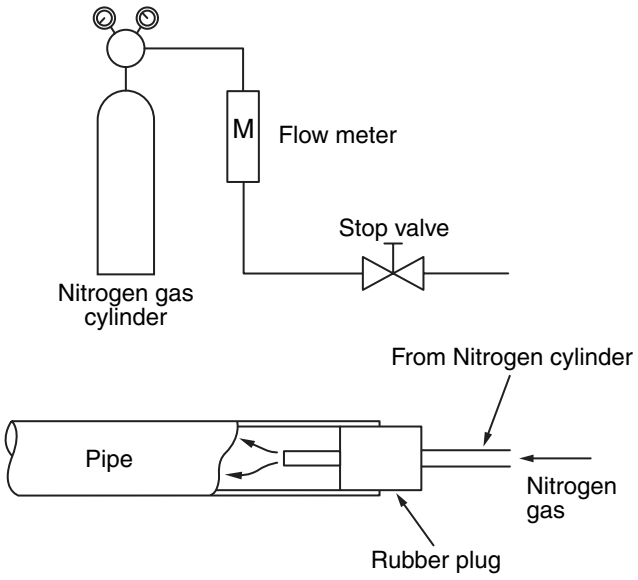
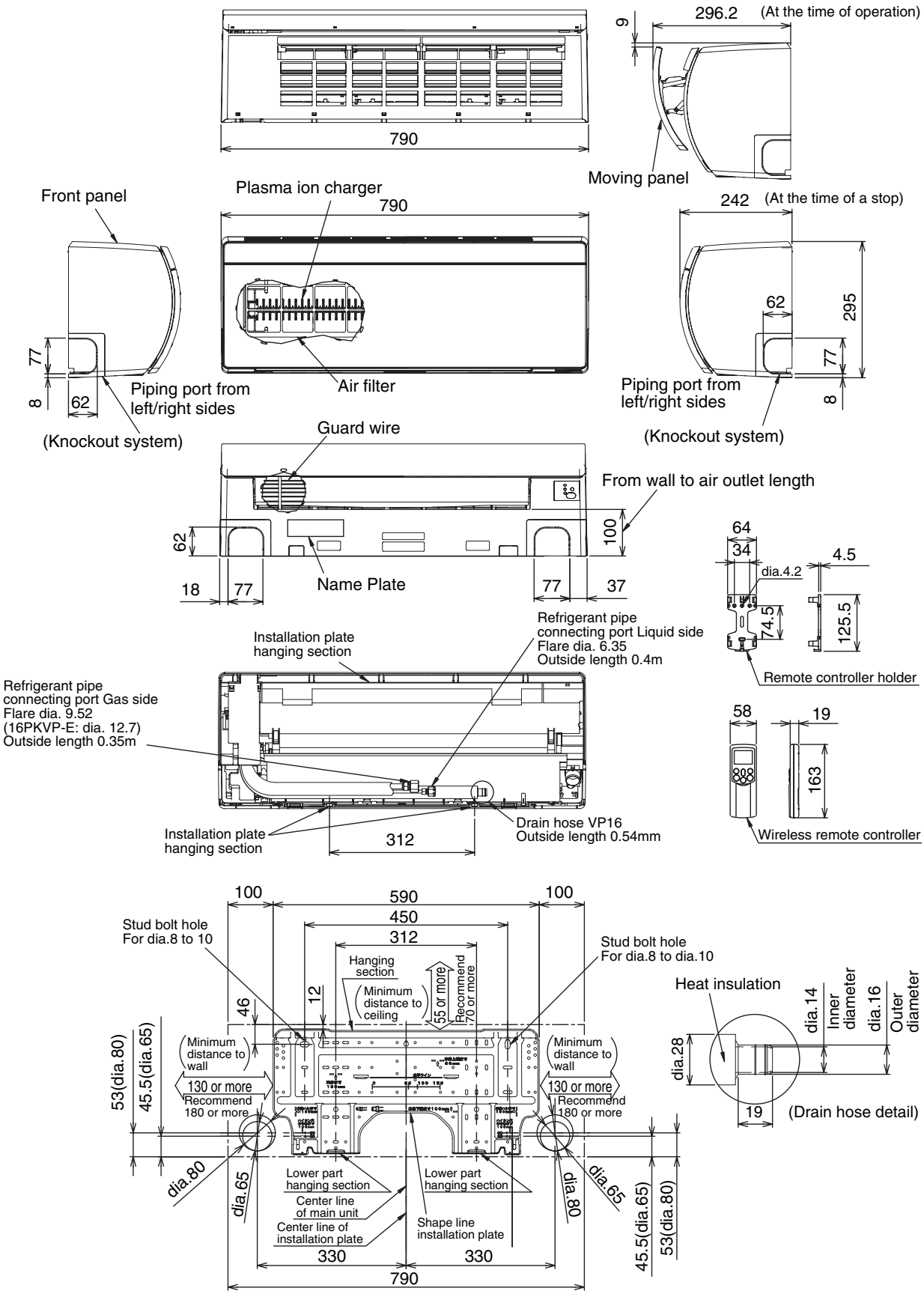


Fig. 3-5-1 Prevention of oxidation during brazing

4. CONSTRUCTION VIEWS

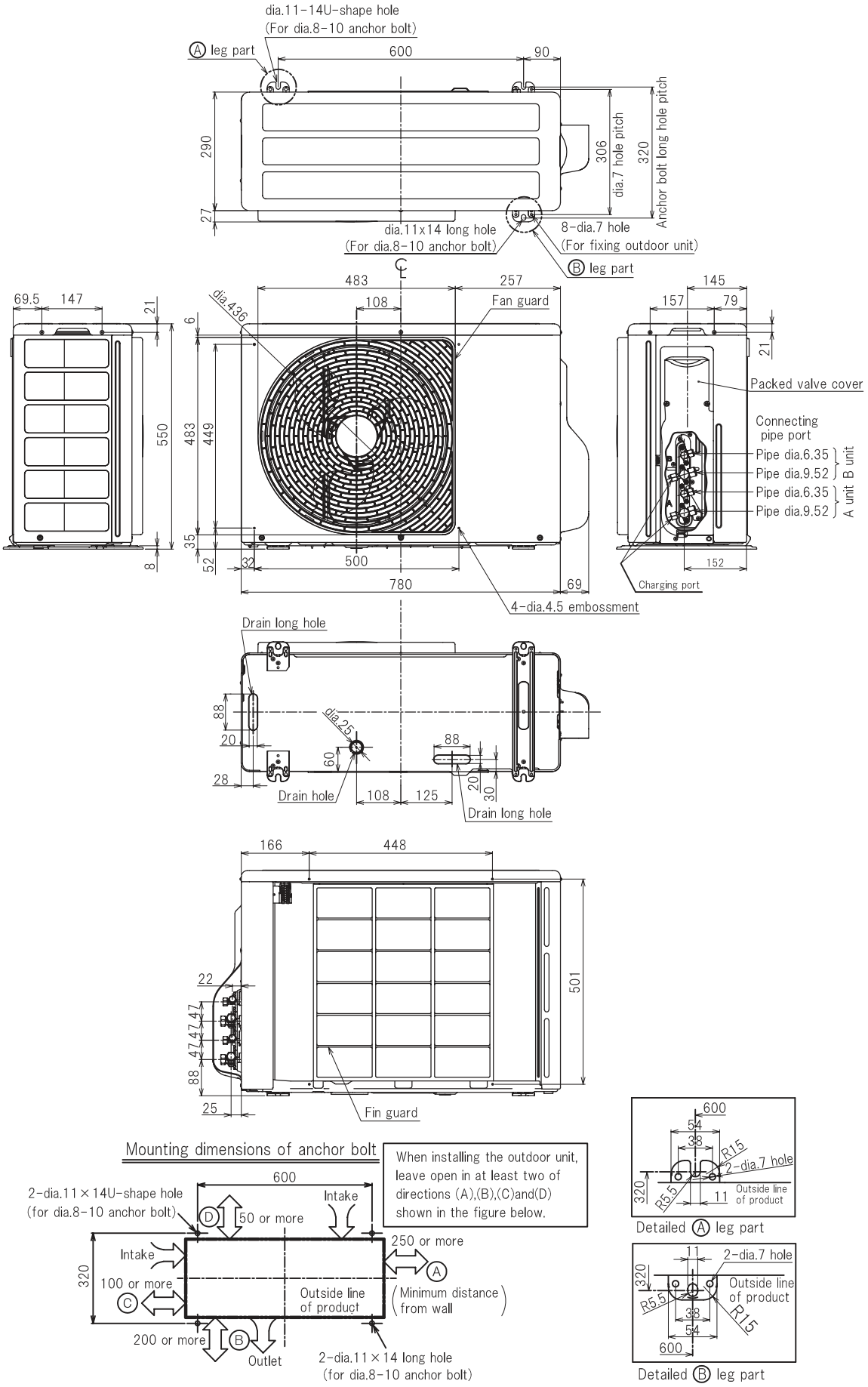
4-1. Indoor Unit

RAS-M10PKVP-E, RAS-M13PKVP-E, RAS-M16PKVP-E



4-2. Outdoor Unit

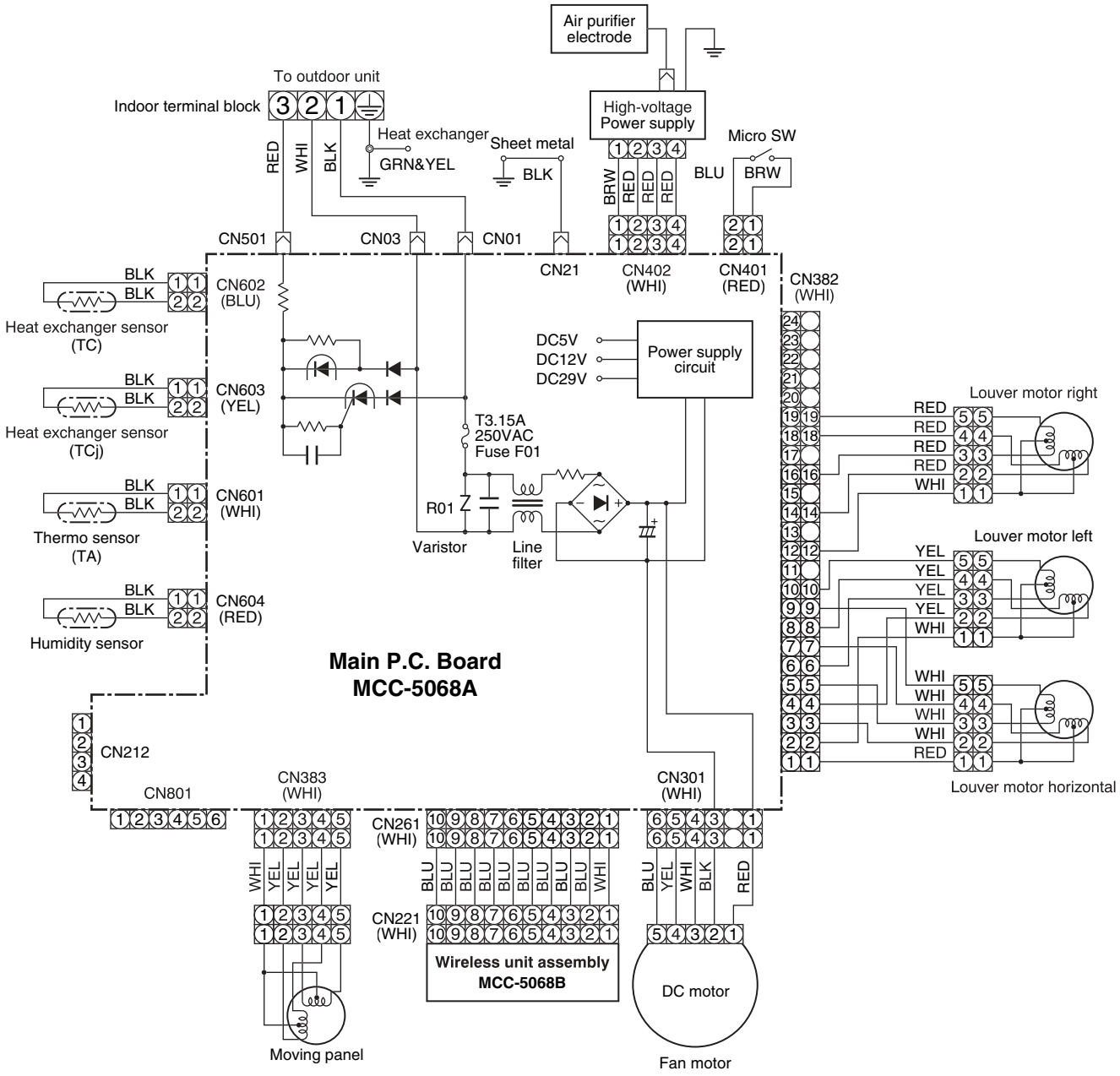
RAS-M18UAV-E (Heat pump models)



5. WIRING DIAGRAM

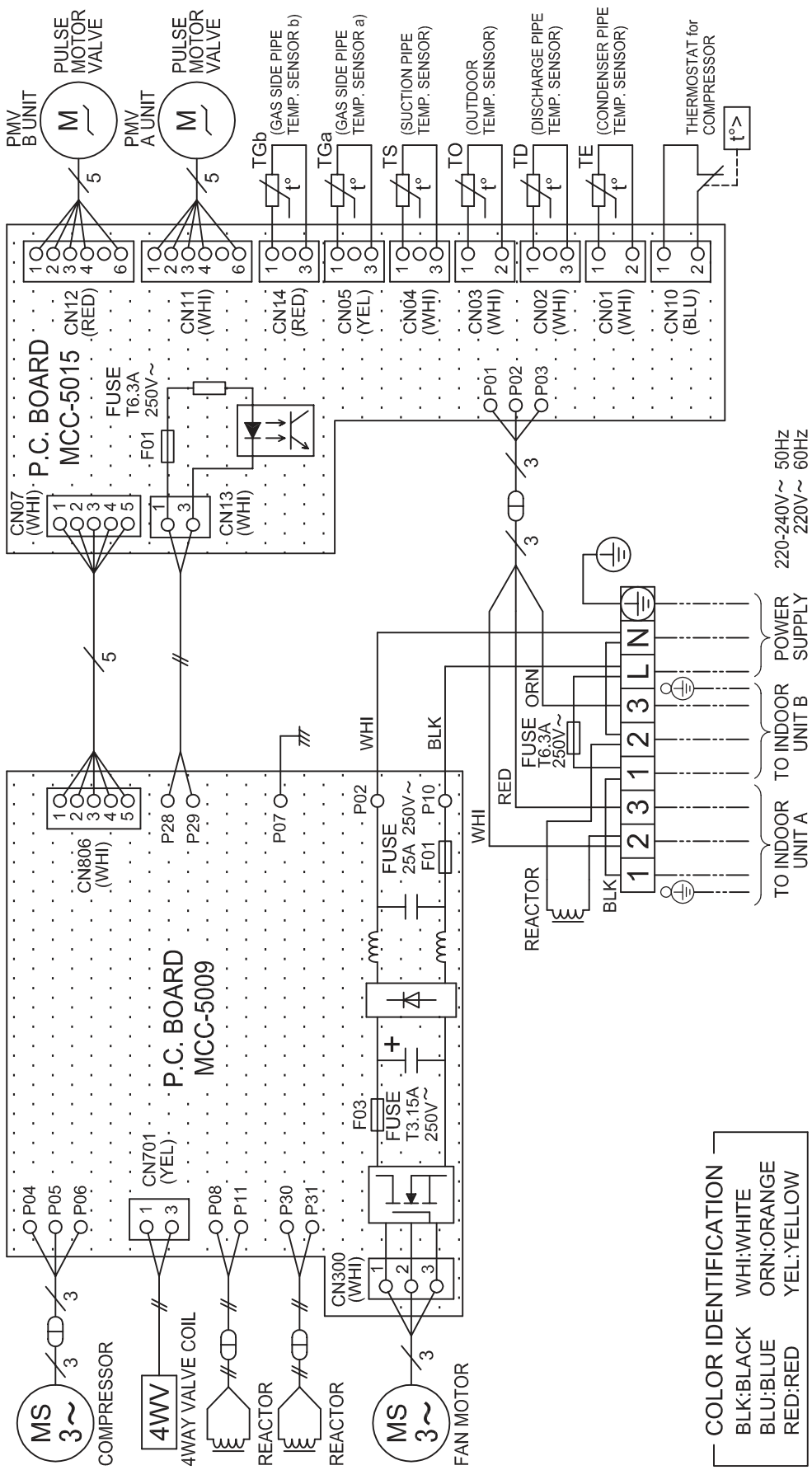
5-1. Indoor Unit

RAS-M10PKVP-E, RAS-M13PKVP-E, RAS-M16PKVP-E



5-2. Outdoor Unit

RAS-M18UAV-E (Heat pump models)



6. SPECIFICATIONS OF ELECTRICAL PARTS

6-1. Indoor Unit

RAS-M10PKVP-E, RAS-M13PKVP-E, RAS-M16PKVP-E

No.	Parts name	Type	Specifications
1	Fan motor (for indoor unit)	ICF-340-30-4	DC 280–340 V, 30 W
2	Room temp. sensor (TA-sensor)	(–)	10 kΩ at 25°C
3	Heat exchanger temp. sensor (TC-sensor)	(–)	10 kΩ at 25°C
4	Heat exchanger temp. sensor (TCj-sensor)	(–)	10 kΩ at 25°C
5	Humidity sensor	C7-M3R-TC2	31 kΩ, 60 % RH
6	Louver motor (Right, Left, Horizontal)	MP24Z3N	Output (Rated) 1 W, 16 poles, DC12 V
7	Louver motor (Moving panel)	MP24Z4N	Output (Rated) 1 W, 16 poles, DC12 V

6-2. Outdoor Unit

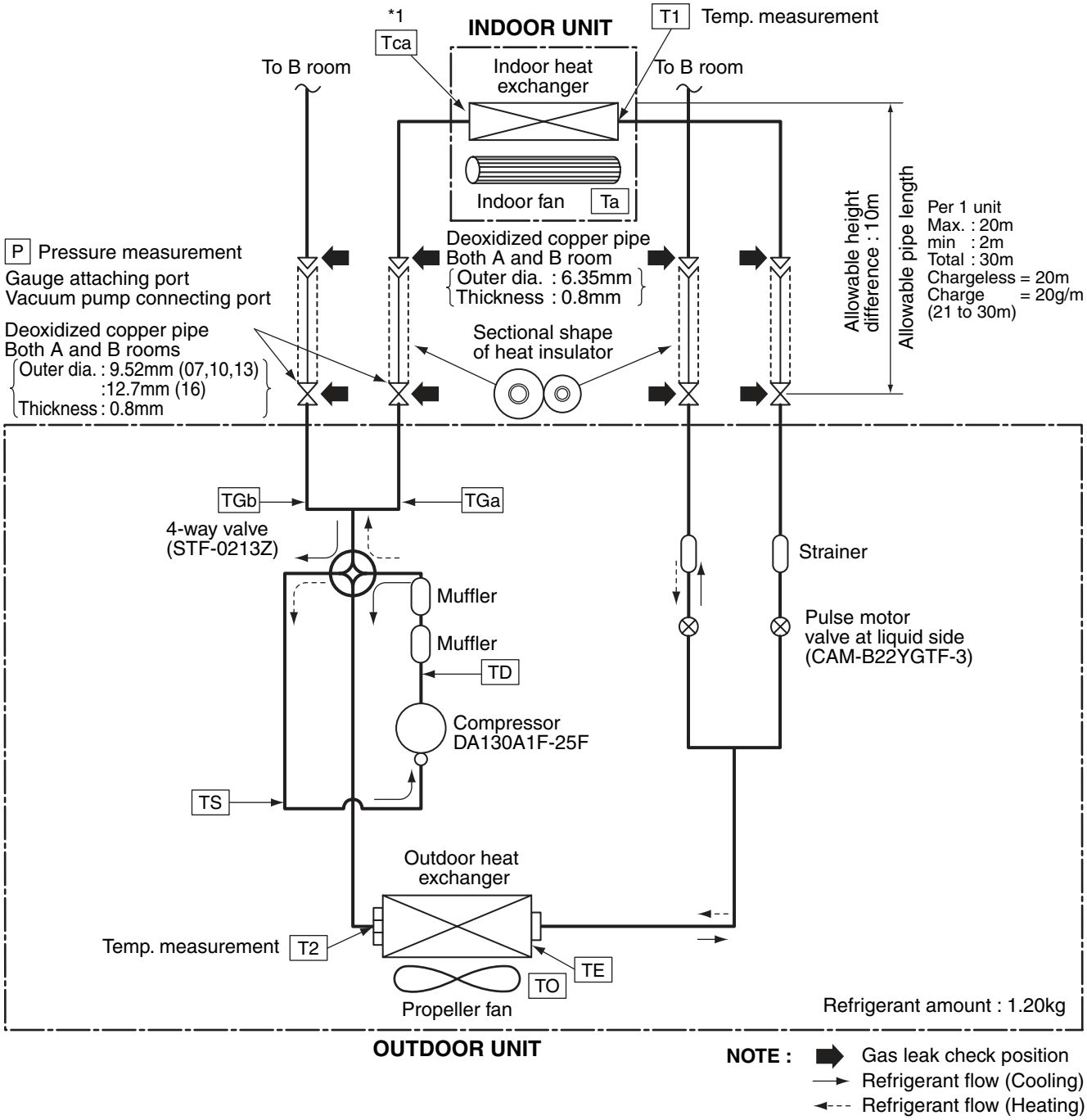
RAS-M18UAV-E

No.	Parts name	Model name	Rating
1	SC coil (Noise filter) (L03)	ADR2520-R15TB	AC 250V, 20A, 0.15mH
	SC coil (Noise filter) (L01)	ADR25H-200R8TB	AC 250V, 20A, 0.88mH
2	DC-DC transformer	SWT-72	Primary side DC 280V Secondary side: 7.5V × 1, 13V × 126.5V × 3, 16V × 1, 15V × 1
3	Fan motor (For outdoor)	ICF-140-43-4R	DC 140V, 43W
4	Relay (4-way valve)	G5NB-1A	Coil: DC 12V, Contact: 3A, AC250V
5	Relay (Power relay)	G4A-1A-PE	Coil: DC 12V, Contact: 20A, AC250V
6	Discharge temp. sensor (TD-sensor)	(Inverter attached)	1,905kΩ (120°C)
7	Outside air temp. sensor (TO-sensor)	(Inverter attached)	10kΩ (25°C)
8	TGa-sensor (Heat pump models)	(Inverter attached)	10kΩ (25°C)
9	TGb-sensor (Heat pump models)	(Inverter attached)	10kΩ (25°C)
10	Evaporator temp. sensor (TE-sensor)	(Inverter attached)	10kΩ (25°C)
11	Suction temp. sensor (TS-sensor)	(Inverter attached)	10kΩ (25°C)
12	Terminal block (9P)	—	AC 250V, 20A
13	Fuse	For protection of switching power source (F03)	AC 250V, 3.15A
		For protection of inverter input overcurrent (F01)	AC 250V, 25A
		For protection of power source	AC 250V, 6.3A
14	Electrolytic capacitor	LLQ2G761KHUATF	DC 400V, 760µF
15	IGBT (Q200~Q205)	GT20J321	600V, 20A
16	Compressor	DA130A1F-25F	3 phases, 4 poles, 1,100W
17	Compressor thermo.	US622KXTMQO	OFF: 125 ± 4°C, ON: 90 ± 5°C
18	Rectifier (DB01, DB02)	D25XB60	Diode: 600V, 25A
19	IGBT (Q404)	GT40Q321	IGBT: 1200V, 40A
20	Reactor (Main)	CH-57-FC, CH-57-Z-T	L = 10mH, 16A
21	Reactor (Sub)	CH-76-TM1, CH-43-Z-T	L = 10mH, 1A
22	Coil for P.M.V.	CAM-MD12TF	DC 12V
23	Coil for 4-way valve	STF-01AJ502E1	AC 220 – 240V

7. REFRIGERANT CYCLE DIAGRAM

7-1. Refrigerant Cycle Diagram

RAS-M10PKVP-E, RAS-M13PKVP-E, RAS-M16PKVP-E
RAS-M18UAV-E



NOTE :

- The maximum pipe length of this air conditioner is 30 m. When the pipe length exceeds 20 m, the additional charging of refrigerant, 20 g per 1m for the part of pipe exceeded 20 m is required. (Max. 200g)

7-2. Operation Data

<Cooling> RAS-M18UAV-E

Temperature condition (°C)		No. of operating units	Operating combination (unit)		Standard pressure	Heat exchanger pipe temp		Indoor fan	Outdoor fan	Compresser revolution (rps)
Indoor	Outdoor		A	B	P (MPa)	T1(°C)	T2(°C)			
27/19	35/–	1 unit	07	—	1.0 to 1.2	12 to 14	35 to 37	High	700rpm	26
			10	—	0.9 to 1.1	12 to 14	36 to 38	High	700rpm	35
			13	—	0.8 to 1.0	10 to 12	36 to 38	High	850rpm	58
			16	—	0.7 to 0.9	8 to 10	36 to 38	High	850rpm	75
		2 units	07	07	0.9 to 1.1	13 to 15	40 to 42	High	850rpm	51
			10	07	0.9 to 1.1	13 to 15	40 to 42	High	850rpm	61
			10	10	0.9 to 1.1	13 to 15	42 to 44	High	850rpm	71
			13	07	0.9 to 1.1	13 to 15	42 to 44	High	850rpm	71
			13	10	0.9 to 1.1	13 to 15	42 to 44	High	850rpm	71
			16	07	0.9 to 1.1	13 to 15	44 to 46	High	850rpm	71
			16	10	0.9 to 1.1	13 to 15	44 to 46	High	850rpm	71
			13	13	0.9 to 1.1	13 to 15	44 to 46	High	850rpm	71
			16	13	0.9 to 1.1	13 to 15	44 to 46	High	850rpm	71

<Heating> RAS-M18UAV-E

Temperature condition (°C)		No. of operating units	Operating combination (unit)		Standard pressure	Heat exchanger pipe temp		Indoor fan	Outdoor fan	Compresser revolution (rps)
Indoor	Outdoor		A	B	P (MPa)	T1(°C)	T2(°C)			
20/–	7/6	1 unit	07	—	2.4 to 2.6	37 to 39	2 to 4	High	750rpm	44
			10	—	2.6 to 2.8	45 to 46	2 to 4	High	900rpm	62
			13	—	3.0 to 3.2	51 to 53	2 to 4	High	900rpm	81
			16	—	3.2 to 3.4	51 to 53	2 to 4	High	900rpm	85
		2 units	07	07	2.1 to 2.3	36 to 38	2 to 4	High	900rpm	70
			10	07	2.1 to 2.3	36 to 38	2 to 4	High	900rpm	72
			10	10	2.1 to 2.3	36 to 38	2 to 4	High	900rpm	74
			13	07	2.1 to 2.3	36 to 38	2 to 4	High	900rpm	75
			13	10	2.1 to 2.3	36 to 38	2 to 4	High	900rpm	75
			16	07	2.0 to 2.2	34 to 36	2 to 4	High	900rpm	75
			16	10	2.0 to 2.2	32 to 34	2 to 4	High	900rpm	75
			13	13	2.0 to 2.2	34 to 36	2 to 4	High	900rpm	75
			16	13	2.0 to 2.2	32 to 34	2 to 4	High	900rpm	75

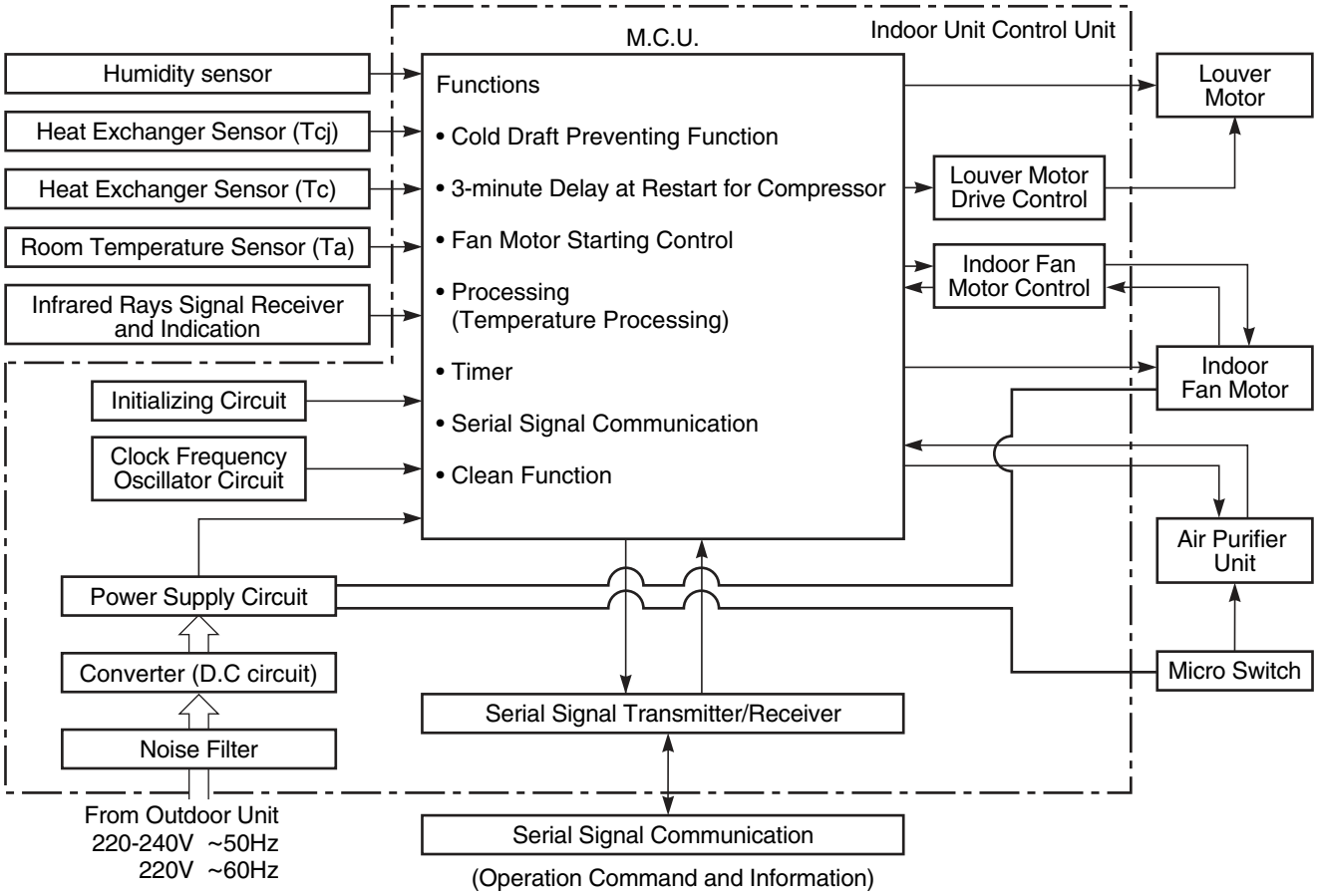
NOTES :

1. Measure surface temperature of heat exchanger pipe around center of heat exchanger path U bent. (Thermistor themometer)
2. Connecting piping condition : 7.5 m × 2 units

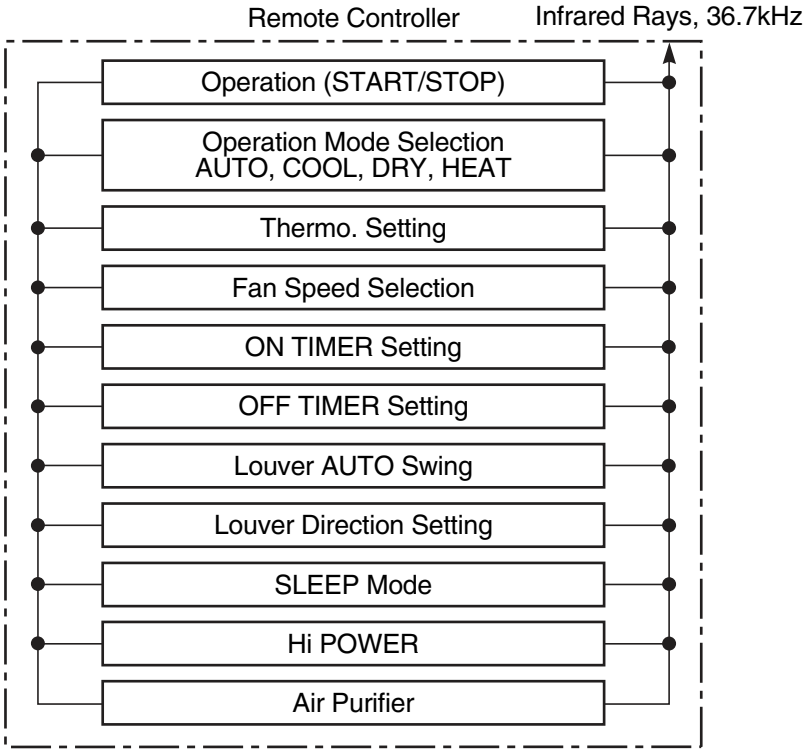
8. CONTROL BLOCK DIAGRAM

8-1. Indoor Unit

RAS-M10PKVP-E, RAS-M13PKVP-E, RAS-M16PKVP-E

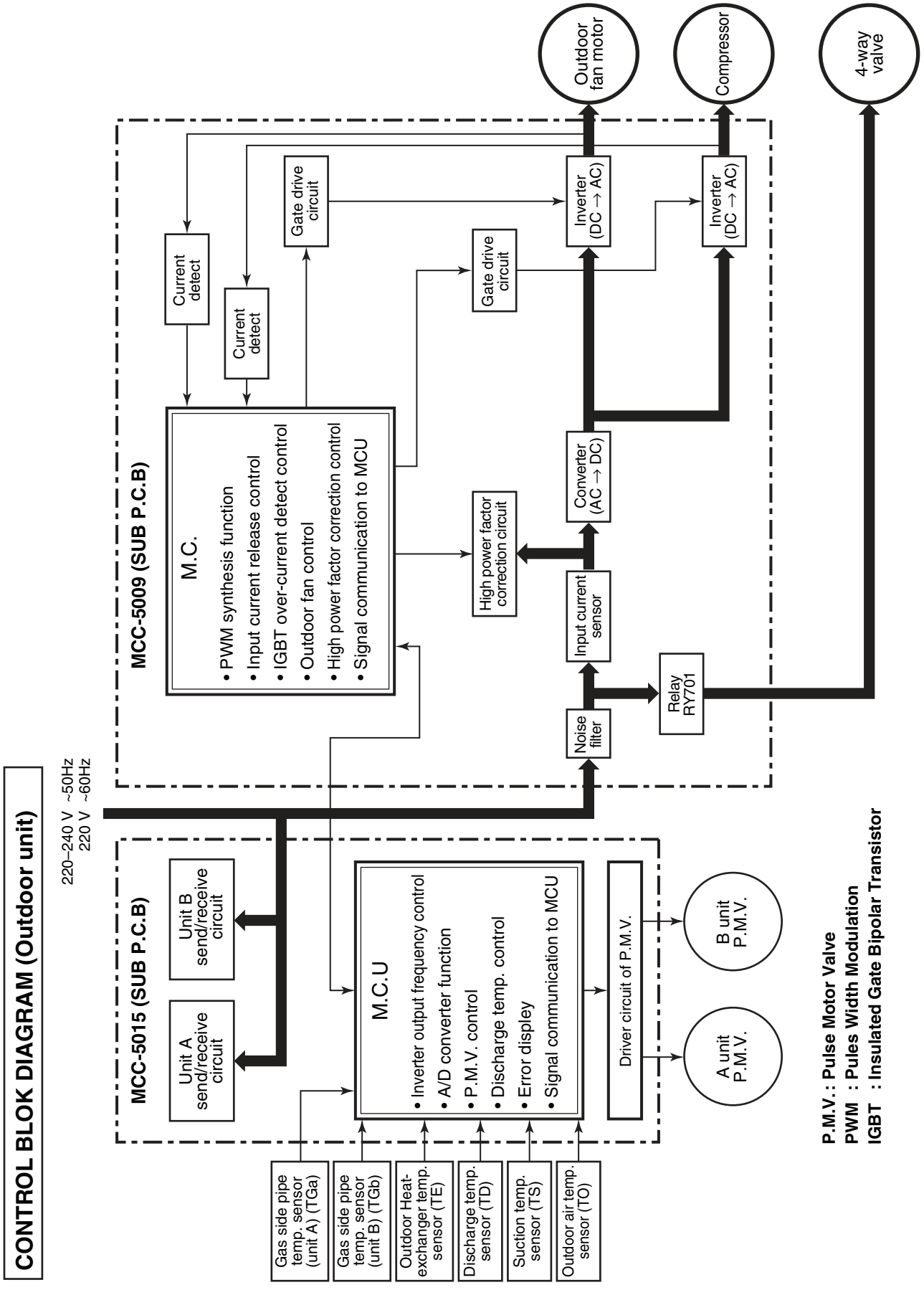


REMOTE CONTROLLER



8-2. Outdoor Unit (Inverter Assembly)

RAS-M18UAV-E (Heat pump models)



9. OPERATION DESCRIPTION

9-1. Outline of Air Conditioner Control

This air conditioner is a capacity-variable type air conditioner, which uses DC motor for the indoor fan motor and the outdoor fan motor. And the capacity-proportional control compressor which can change the motor speed in the range from 13 to 115 rps is mounted. The DC motor drive circuit is mounted to the indoor unit. The compressor and the inverter to control fan motor are mounted to the outdoor unit.

The entire air conditioner is mainly controlled by the indoor unit controller.

The indoor unit controller drives the indoor fan motor based upon command sent from the remote controller, and transfers the operation command to the outdoor unit controller.

The outdoor unit controller receives operation command from the indoor unit side, and controls the outdoor fan and the pulse motor valve. (P.M.V)

Besides, detecting revolution position of the compressor motor, the outdoor unit controller controls speed of the compressor motor by controlling output voltage of the inverter and switching timing of the supply power (current transfer timing) so that motors drive according to the operation command.

And then, the outdoor unit controller transfers reversely the operating status information of the outdoor unit to control the indoor unit controller.

As the compressor adopts four-pole brushless DC motor, the frequency of the supply power from inverter to compressor is two-times cycles of the actual number of revolution.

1. Role of indoor unit controller

The indoor unit controller judges the operation commands from the remote controller and assumes the following functions.

- Judgment of suction air temperature of the indoor heat exchanger by using the indoor temp. sensor. (TA sensor)
- Judgment of the indoor heat exchanger temperature by using heat exchanger sensor (TC sensor) (Prevent-freezing control, etc.)
- Louver motor control
- Indoor fan motor operation control
- LED (Light Emitting Diode) display control
- Transferring of operation command signal (Serial signal) to the outdoor unit
- Reception of information of operation status (Serial signal including outside temp. data) to the outdoor unit and judgment/display of error
- Air purifier operation control

2. Role of outdoor unit controller

Receiving the operation command signal (Serial signal) from the indoor unit controller, the outdoor unit performs its role.

- Compressor operation control
- Operation control of outdoor fan motor
- P.M.V. control
- 4-way valve control

} Operations followed to judgment of serial signal from indoor side.

- Detection of inverter input current and current release operation
- Over-current detection and prevention operation to IGBT module (Compressor stop function)
- Compressor and outdoor fan stop function when serial signal is off (when the serial signal does not reach the board assembly of outdoor control by trouble of the signal system)
- Transferring of operation information (Serial signal) from outdoor unit controller to indoor unit controller
- Detection of outdoor temperature and operation revolution control
- Defrost control in heating operation (Temp. measurement by outdoor heat exchanger and control for 4-way valve and outdoor fan)

3. Contents of operation command signal (Serial signal) from indoor unit controller to outdoor unit controller

The following three types of signals are sent from the indoor unit controller.

- Operation mode set on the remote controller
- Compressor revolution command signal defined by indoor temperature and set temperature (Correction along with variation of room temperature and correction of indoor heat exchanger temperature are added.)
- Temperature of indoor heat exchanger
- For these signals ([Operation mode] and [Compressor revolution] indoor heat exchanger temperature), the outdoor unit controller monitors the input current to the inverter, and performs the followed operation within the range that current does not exceed the allowable value.

4. Contents of operation command signal (Serial signal) from outdoor unit controller to indoor unit controller

The following signals are sent from the outdoor unit controller.

- The current operation mode
- The current compressor revolution
- Outdoor temperature
- Existence of protective circuit operation

  For transferring of these signals, the indoor unit controller monitors the contents of signals, and judges existence of trouble occurrence.

  Contents of judgment are described below.

  - Whether distinction of the current operation status meets to the operation command signal
  - Whether protective circuit operates

    When no signal is received from the outdoor unit controller, it is assumed as a trouble.

9-2. Operation Description

9-2. 1. Basic operation 28
1. Operation control 28
2. Operating mode selection when performing 2-room operation 29
3. Cooling/Heating operation 29
4. AUTO operation 30
5. DRY operation 30
2. Indoor fan motor control 31
<In cooling operation> 31
<In heating operation> (Heat pump model) 32
3. Outdoor fan motor control 34
4. Capacity control 35
5. Current release control 35
6. Release protective control by temperature of indoor heat exchanger 36
7. Winding/Coil heating control 37
8. Defrost control (Only in heating operation) 37
9. Louver control 38
1) Louver position 38
2) Air direction adjustment 38
3) Swing 38
10. SLEEP MODE operation 39
11. Temporary operation 40
12. Air purifying control 40
13. Discharge temperature control 42
14. Pulse motor valve (P.M.V.) control 42
15. Clean operation 43
16. Clean operation cancel 44
17. Select switch on remote controller 45
18. Set temperature correction 46

9-3. Auto Restart Function 47

9-3-1. Setting the Auto Restart Function 47

9-3-2. Cancel the Auto Restart Function 48

9-3-3. Power Failure During Timer Operation 48

9-4. Remote Controller and Its Functions 49

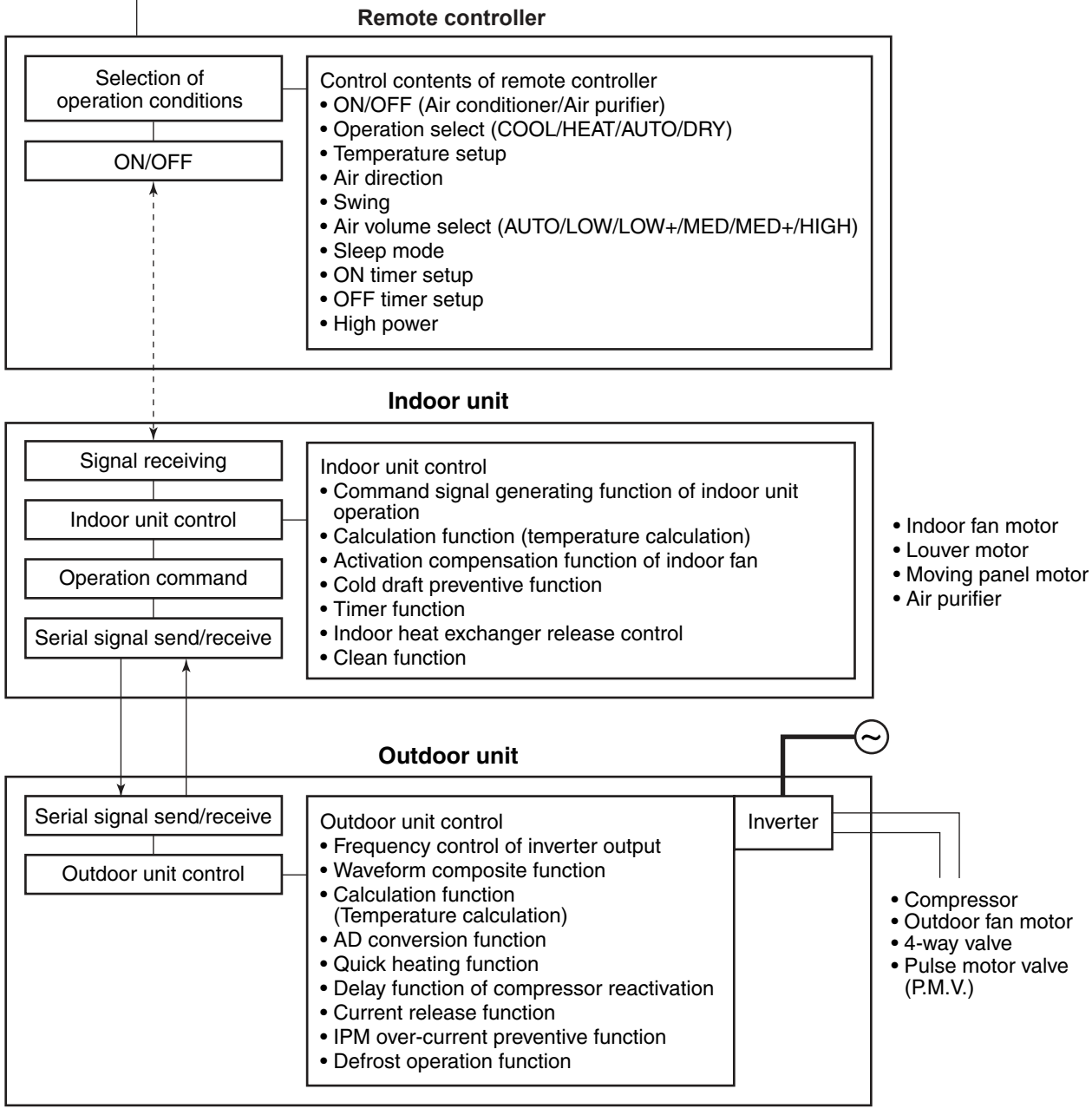
9-4-1. Parts Name of Remote Controller 49

9-4-2. Name and Functions of Indications on Remote Controller 50

9-5. Hi-POWER Mode 51

9-6. Intermittent Operation Control for Indoor Fans of the Indoor Unit at Thermo-off Side in Heating Operation 51

Item	Operation flow and applicable data, etc.	Description
1. Basic operation	**1. Operation control** Receiving the user's operation condition setup, the operation statuses of indoor/outdoor units are controlled. 1) The operation conditions are selected by the remote controller as shown in the below. 2) A signal is sent by ON button of the remote controller. 3) The signal is received by a sensor of the indoor unit and processed by the indoor controllers as shown in the below. 4) The indoor controller controls the indoor fan motor and louver motor. 5) The indoor controller sends the operation command to the outdoor controller, and sends/receives the control status with a serial signal. 6) The outdoor controller controls the operation as shown in the below, and also controls the compressor, outdoor fan motor, 4-way valve and pulse motor valve.	



Item	Operation flow and applicable data, etc.	Description
1. Basic operation (Continued)		

2. Operating mode selection when performing 2-room operation

1) The outdoor unit operating mode conforms to the instructions of the indoor unit that was pushed first.
2) When combined operation consisting of cooling (dry) and heating, fan (air purification) and heating, or cleaning operation and heating is performed, operation conforms to the instructions of the indoor unit that was pushed first as shown in the following table.
3) The indoor fan stops for the indoor unit that was pushed last and which instructions are ignored.

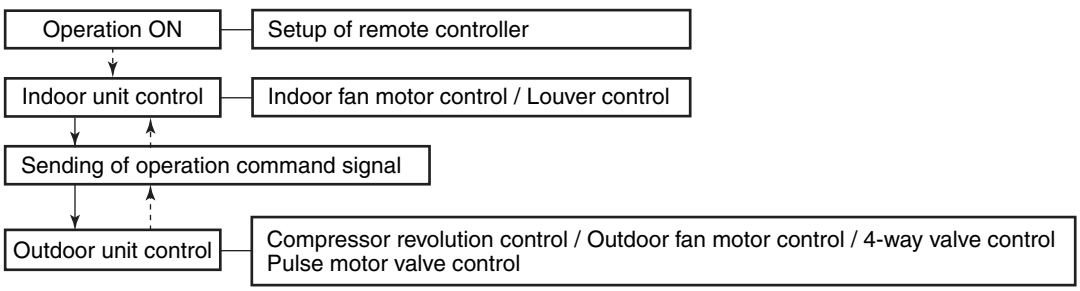
No.	Indoor unit	Set operating mode	Actual indoor unit operation	Actual outdoor unit operation
1	Pushed first	Cooling (dry)	Cooling (dry)	Cooling
	Pushed last	Cooling (dry)	Cooling (dry)	
2	Pushed first	Heating	Heating	Heating
	Pushed last	Heating	Heating	
3	Pushed first	Fan (solo air purification)	Fan (solo air purification)	Stopped
	Pushed last	Fan (solo air purification)	Fan (solo air purification)	
4	Pushed first	Fan (solo air purification)	Fan (solo air purification)	Cooling
	Pushed last	Cooling (dry)	Cooling (dry)	
5	Pushed first	Cooling (dry)	Cooling (dry)	Cooling
	Pushed last	Fan (solo air purification)	Fan (solo air purification)	
6	Pushed first	Cooling (dry)	Cooling (dry)	Cooling
	Pushed last	Heating	Fan stopped	
7	Pushed first	Heating	Heating	Heating
	Pushed last	Cooling (dry)	Fan stopped	
8	Pushed first	Fan (solo air purification)	Fan (solo air purification)	Stopped
	Pushed last	Heating	Fan stopped	
9	Pushed first	Heating	Heating	Heating
	Pushed last	Fan (solo air purification)	Fan stopped	
10	Pushed first	Cleaning operation	Cleaning operation	Stopped
	Pushed last	Cleaning operation	Cleaning operation	
11	Pushed first	Cleaning operation	Cleaning operation	Cooling
	Pushed last	Cooling (dry)	Cooling (dry)	
12	Pushed first	Cooling (dry)	Cooling (dry)	Cooling
	Pushed last	Cleaning operation	Cleaning operation	
13	Pushed first	Cleaning operation	Cleaning operation	Stopped
	Pushed last	Fan (solo air purification)	Fan (solo air purification)	
14	Pushed first	Fan (solo air purification)	Fan (solo air purification)	Stopped
	Pushed last	Cleaning operation	Cleaning operation	
15	Pushed first	Cleaning operation	Cleaning operation	Stopped
	Pushed last	Heating	Fan stopped	
16	Pushed first	Heating	Heating	Heating
	Pushed last	Cleaning operation	Fan stopped	

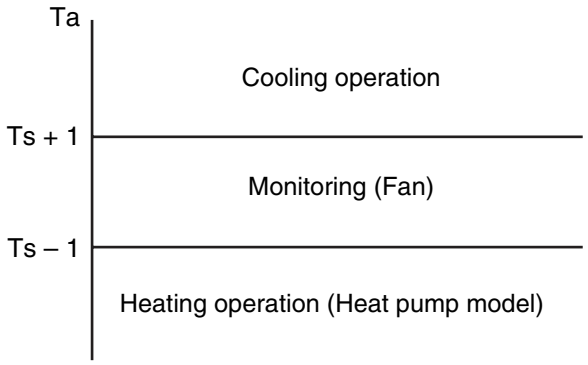
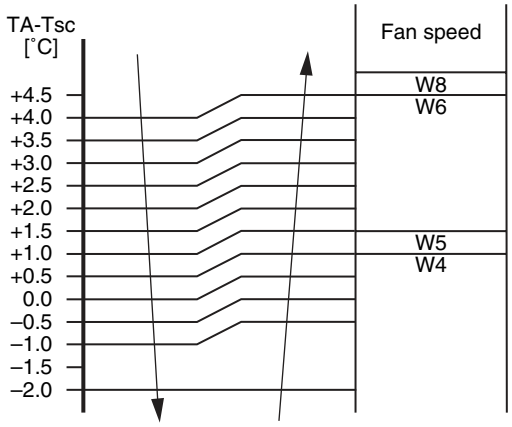
3. Cooling/Heating operation

The operations are performed in the following parts by controls according to cooling/heating conditions.

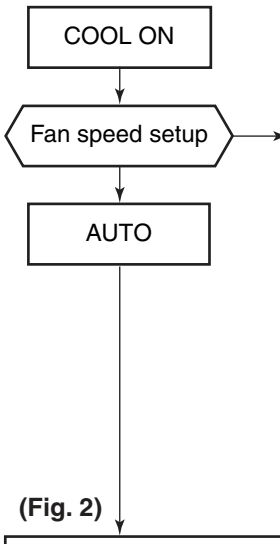
1) Receiving the operation ON signal of the remote controller, the cooling or heating operation signal starts being transferred from the indoor controller to the outdoor unit.
2) At the indoor unit side, the indoor fan is operated according to the contents of "**2. Indoor fan motor control**" and the louver according to the contents of "**9. Louver control**", respectively.
3) The outdoor unit controls the outdoor fan motor, compressor, pulse motor valve (PMV) and 4-way valve according to the operation signal sent from the indoor unit.

*1. The relay of 4-way valve is turned on, for a few seconds when 4-way valve is driven.


Operation ON
Setup of remote controller
Indoor unit control
Indoor fan motor control / Louver control
Sending of operation command signal
Outdoor unit control
Compressor revolution control / Outdoor fan motor control / 4-way valve control
Pulse motor valve control

Item	Operation flow and applicable data, etc.	Description
1. Basic operation (Continued)	**4. AUTO operation** Selection of operation mode As shown in the following figure, the operation starts by selecting automatically the status of room temperature (Ta) when starting AUTO operation.  *1. When reselecting the operation mode, the fan speed is controlled by the previous operation mode.	1) Detects the room temperature (Ta) when the operation started. 2) Selects an operation mode from Ta in the left figure. 3) Fan operation continues until an operation mode is selected. 4) When AUTO operation has started within 2 hours after heating operation stopped and if the room temperature is 20°C or more, the fan operation is performed with ”Super Ultra LOW” mode for 3 minutes. Then, select an operation mode. 5) If the status of compressor-OFF continues for 15 minutes the room temperature after selecting an operation mode (COOL/ HEAT), reselect an operation mode.
	5. DRY operation DRY operation is performed according to the difference between room temperature and the setup temperature as shown below. In DRY operation, fan speed is controlled in order to prevent lowering of the room temperature.  	1) Detects the room temperature (Ta) when the DRY operation started. 2) Starts operation under conditions in the left figure according to the temperature difference between the room temperature and the setup temperature (Tsc). Setup temperature (Tsc) = Set temperature on remote controller (Ts) + (–1.5 to 2.0) 3) When the room temperature is lower 2°C or less than the setup temperature, turn off the compressor.

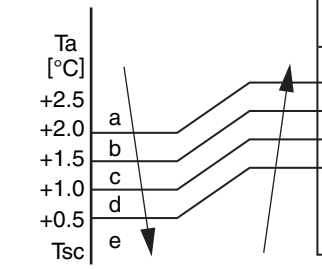
Item	Operation flow and applicable data, etc.	Description
2. Indoor fan motor control	**<In cooling operation>** (This operation controls the fan speed at indoor unit side.) The indoor fan (cross flow fan) is operated by the phase control induction motor. The fan rotates in 5 stages in MANUAL mode, and in 5 stages in AUTO mode, respectively. (Table 1)	



(Fig. 1)

Indication	Fan speed	Hi Power
L	W7	W8
L+	(L + M) / 2	(L + M) / 2
M	WA	WC
M+	(M + H) / 2	(M + H) / 2
H	WD	WE

(Fig. 2)



Fan speed	Hi Power
M+(WC)	H (WD)
*3	*6
*4	*7
*5	*8
L(W7)	L+(W8)

*3 : Fan speed = (M + –L) × 3/4 + L
*4 : Fan speed = (M + –L) × 2/4 + L
*5 : Fan speed = (M + –L) × 1/4 + L

*6 : Fan speed = (H –L+) × 3/4 + L+
*7 : Fan speed = (H –L+) × 2/4 + L+
*8 : Fan speed = (H –L+) × 1/4 + L+
(Linear approximation from M+ and L)

*** Symbols**

UH	: Ultra High
H	: High
M+	: Medium+
M	: Medium
L+	: Low+
L	: Low
L-	: Low–
UL	: Ultra Low
SUL	: Super Ultra Low

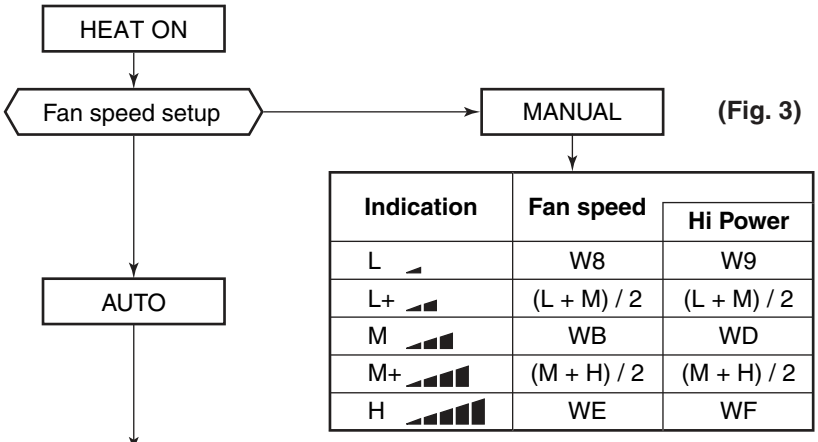
* The fan speed broadly varies due to position of the louver, etc. The described value indicates one under condition of inclining downward blowing.

1) When setting the fan speed to L, L+, M, M+ or H on the remote controller, the operation is performed with the constant speed shown in Fig. 1.
2) When the fan speed mode is manual and TA < 22°C and the compressor stops, the fan speed is controlled from W2 (20 seconds) to 0 rpm (40 seconds).
3) When setting the fan speed to AUTO on the remote controller, revolution of the fan motor is controlled to the fan speed level shown in Fig. 2 and Table 1 according to the setup temperature, room temperature, and heat exchanger temperature.
4) When the fan speed mode is AUTO and the compressor stops, the fan speed is controlled from W2 (20 seconds) to 0 rpm (40 seconds).

(Table 1) Indoor fan air flow rate (Cooling, Dry)

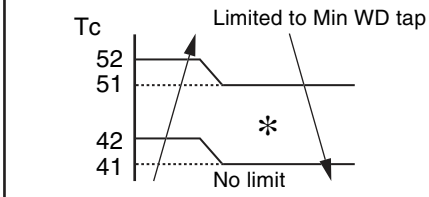
Fan speed level		RAS-M10PKVP-E		RAS-M13PKVP-E		RAS-M16PKVP-E	
		Fan speed (rpm)	Air flow rate (m^3/h)	Fan speed (rpm)	Air flow rate (m^3/h)	Fan speed (rpm)	Air flow rate (m^3/h)
WF		1200	690	1260	730	1340	790
WE	UH	1200	690	1260	730	1340	790
WD	H	1140	640	1210	690	1280	750
WC	M+	1080	600	1130	640	1200	690
WB		1020	560	1060	590	1120	630
WA	M	960	510	990	530	1040	570
W9		910	480	930	490	980	530
W8	L+	850	430	870	450	930	490
W7	L	790	390	810	400	880	450
W6	L–	770	370	770	370	770	370
W5	UL	700	320	700	320	700	320
W4		650	290	650	290	650	290
W3	SUL	600	250	600	250	600	250
W2		600	250	600	250	600	250
W1		520	190	520	190	520	190

Item	Operation flow and applicable data, etc.	Description
2. Indoor fan motor control (Continued)	**<In heating operation> (Heat pump model)** (This operation controls the fan speed at indoor unit side.) The indoor fan (cross flow fan) is operated by the phase control induction motor. The fan rotates in 5 stages in MANUAL mode, and in 5 stages in AUTO mode, respectively. (Table 2)	1) When setting the fan speed to L, L+, M, M+ or H on the remote controller, the operation is performed with the constant speed shown in Fig. 3 and Table 2. 2) When setting the fan speed to AUTO on the remote controller, revolution of the fan motor is controlled to the fan speed level shown in Fig. 5 according to the set temperature and room temperature. 3) Min air flow rate is controlled by temperature of the indoor heat exchanger (Tc) as shown in Fig. 4. 4) Cold draft prevention, the fan speed is controlled by temperature of the indoor heat exchanger (Tc) as shown in Fig. 6.



(Fig. 3)

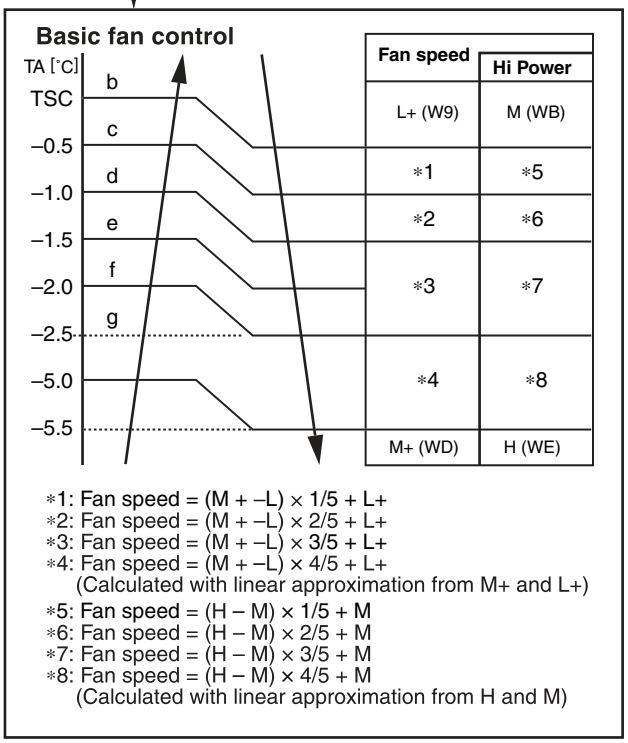
Indication	Fan speed	Hi Power
L	W8	W9
L+	(L + M) / 2	(L + M) / 2
M	WB	WD
M+	(M + H) / 2	(M + H) / 2
H	WE	WF



* Fan speed =
(TC – (40 + a)) / 10 × (WD – W8) + W8
a : In up operation 1, in down operation 0

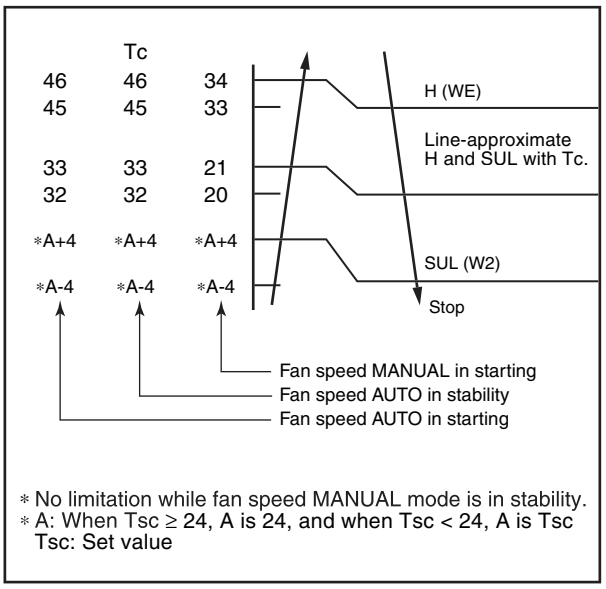
(Fig. 4)

Cold draft preventive control



*1: Fan speed = (M + –L) × 1/5 + L+
*2: Fan speed = (M + –L) × 2/5 + L+
*3: Fan speed = (M + –L) × 3/5 + L+
*4: Fan speed = (M + –L) × 4/5 + L+
(Calculated with linear approximation from M+ and L+)
*5: Fan speed = (H – M) × 1/5 + M
*6: Fan speed = (H – M) × 2/5 + M
*7: Fan speed = (H – M) × 3/5 + M
*8: Fan speed = (H – M) × 4/5 + M
(Calculated with linear approximation from H and M)

(Fig. 5)



* No limitation while fan speed MANUAL mode is in stability.
* A: When Tsc ≥ 24, A is 24, and when Tsc < 24, A is Tsc
Tsc: Set value

(Fig. 6)

Item	Operation flow and applicable data, etc.	Description
2. Indoor fan motor control (Continued)		

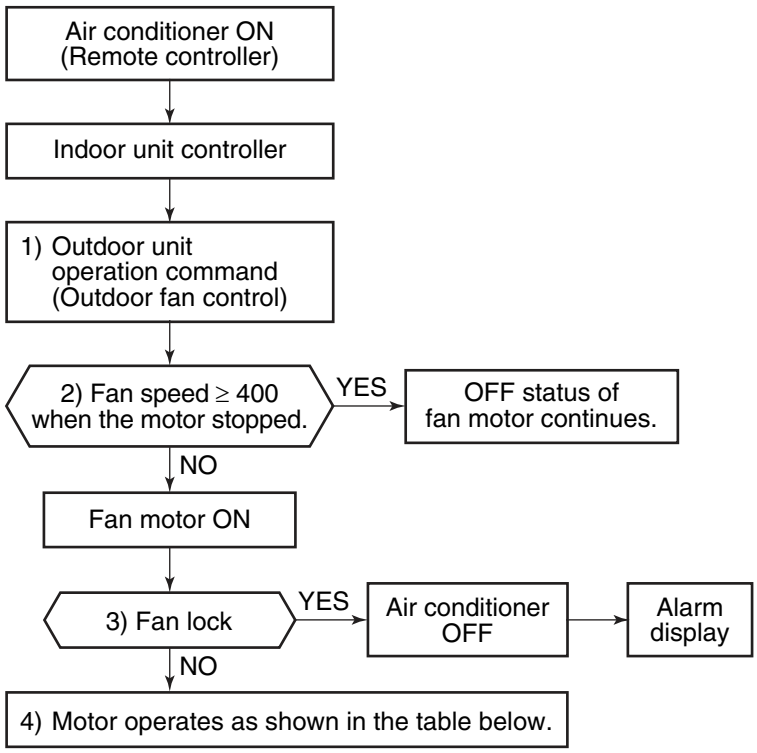
[In starting and in stability]

	In starting	In stability
FAN AUTO	• Until 12 minutes passed after operation start • When 12 to 25 minutes passed after operation start and room temp. is 3°C or lower than set temp.	• When 12 to 25 minutes passed after operation start and room temp. is higher than (set temp. –3°C) • When 25 minutes or more passed after operation start
FAN Manual	• Room temp. < Set temp. –4°C	• Room temp. ≥ Set temp. –3.5°C

(Table 2) Indoor fan air flow rate (Heating)

Fan speed level		RAS-M10PKVP-E		RAS-M13PKVP-E		RAS-M16PKVP-E	
		Fan speed (rpm)	Air flow rate (m^3/h)	Fan speed (rpm)	Air flow rate (m^3/h)	Fan speed (rpm)	Air flow rate (m^3/h)
WF		1140	640	1200	690	1280	750
WE	UH	1140	640	1200	690	1280	750
WD	H	1070	590	1100	610	1180	670
WC	M+	980	530	1010	550	1090	610
WB		900	470	930	490	980	530
WA	M	850	430	850	430	900	470
W9		810	400	810	400	880	450
W8	L+	710	330	710	330	780	380
W7	L	710	330	710	330	710	330
W6	L–	650	290	650	290	700	320
W5	UL	650	290	650	290	650	290
W4		650	290	650	290	650	290
W3	SUL	650	290	650	290	650	290
W2		560	220	560	220	560	220
W1		420	120	420	120	420	120

Item	Operation flow and applicable data, etc.	Description
3. Outdoor fan motor control	The blowing air volume at the outdoor unit side is controlled. Receiving the operation command from the controller of indoor unit, the controller of outdoor unit controls fan speed. * For the fan motor, a DC motor with non-stage variable speed system is used. However, it is limited to 8 stages for reasons of controlling.	1) The operation command sent from the remote controller is processed by the indoor unit controller and transferred to the controller of the outdoor unit. 2) When strong wind blows at outdoor side, the operation of air conditioner continues with the fan motor stopped. 3) Whether the fan is locked or not is detected, and the operation of air conditioner stops and an alarm is displayed if the fan is locked. 4) According to each operation mode, by the conditions of outdoor temperature (To) and compressor revolution, the speed of the outdoor fan shown in the table is selected.



RAS-M18UAV-E
Cooling operation, dry operation

Compressor revolution (rps)		~20	~30	~46	46~
Normal operation	TO > 38°C	450	700	850	850
	28 < TO ≤ 38	450	700	700	850
	15 < TO ≤ 28	350	550	700	700
	10 < TO ≤ 15	350	550	550	550
	5.5 < TO ≤ 10	300	450	450	550
	0 < TO ≤ 5.5	300	350	350	450
Sleep operation	TO > 38°C	450	700	700	850
	TO ≤ 38°C	350	450	550	550
TO is abnormal	—	450	700	850	850

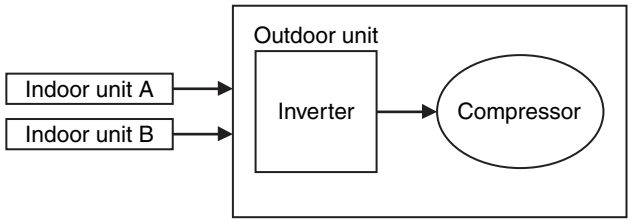
TO: Outdoor sensor temp. (°C) (rpm)

Heating operation

Compressor revolution (rps)		~20		~48		48~	
Fan revolution		MIN	MAX	MIN	MAX	MIN	MAX
Normal operation	TO > 10°C	250	400	250	600	250	750
	5.5 < TO ≤ 10	250	400	250	750	250	900
	–5 < TO ≤ 5.5	250	600	250	750	250	950
	TO ≤ –5	250	600	250	750	250	950
Sleep operation	TO > 10°C	250	400	250	500	250	600
	5.5 < TO ≤ 10	250	400	250	600	250	750
	–5 < TO ≤ 5.5	250	600	250	750	250	750
	TO ≤ –5	250	600	250	750	250	750
TO is abnormal	—	250	400	250	750	250	750

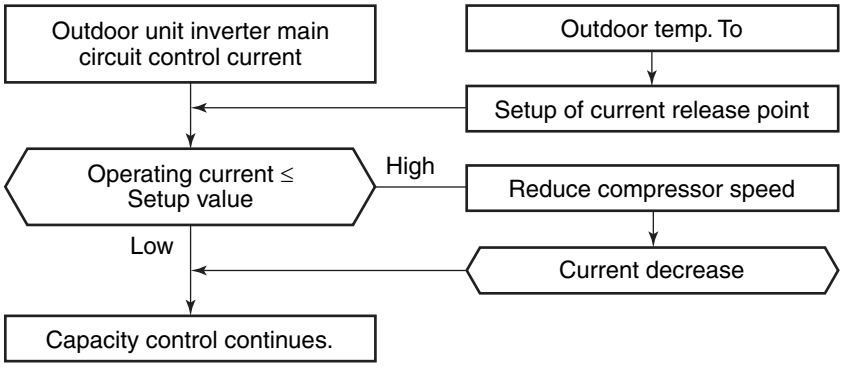
TO: Outdoor sensor temp. (°C) (rpm)

Item	Operation flow and applicable data, etc.	Description
4. Capacity control	1) Two indoor units from A and B determine the respective instruction revolutions from the difference between the remote controller setting temperature (Ts) and the indoor temperature (Ta), and transmit this to the outdoor unit. 2) The outdoor unit receives the instructions from the indoor units, and the inverter operates the compressor at the calculated revolutions. 3) The compressor operation range in each operating mode is shown in the left table.	

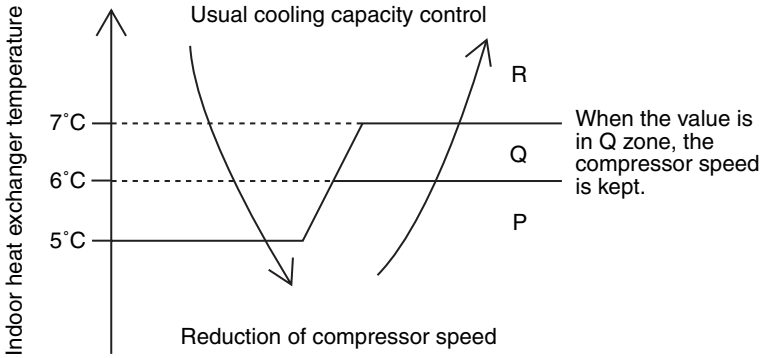
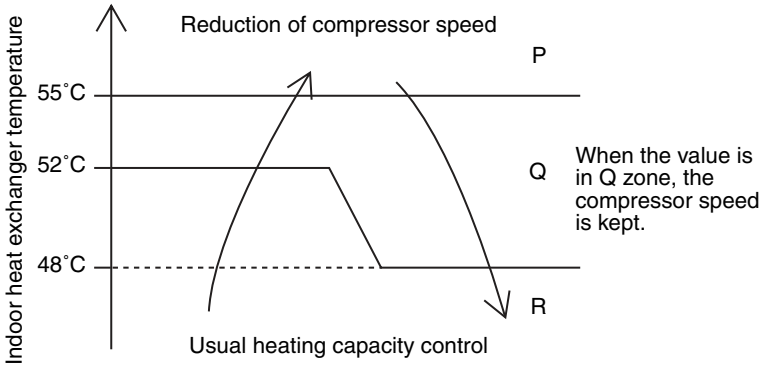


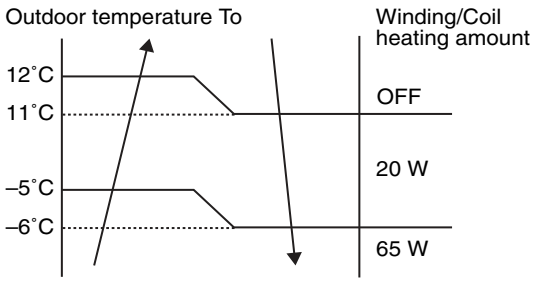
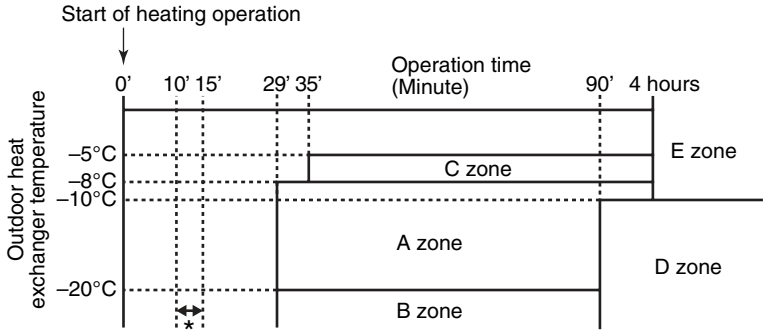
Operation mode	No.of operating unit	Combination of indoor units		Compressor revolution (rps)	Operation mode	No.of operating unit	Combination of indoor units		Compressor revolution (rps)
Cooling	1 unit	07	–	13 to 45	Heating	1 unit	07	–	13 to 76
		10	–	13 to 45			10	–	13 to 76
		13	–	13 to 71			13	–	13 to 99
		16	–	13 to 79			16	–	13 to 102
	2 units	07	07	15 to 83		2 units	07	07	15 to 110
		10	07	15 to 83			10	07	15 to 120
		10	10	15 to 83			10	10	15 to 120
		13	07	15 to 83			13	07	15 to 120
		13	10	15 to 83			13	10	15 to 120
		16	07	15 to 83			16	07	15 to 120
		16	10	15 to 83			16	10	15 to 120
		13	13	15 to 83			13	13	15 to 120
		16	13	15 to 83			16	13	15 to 120

5. Current release control	This function prevents troubles on the electronic parts of the compressor driving inverter. This function also controls drive circuit of the compressor speed so that electric power of the compressor drive circuit does not exceed the specified value.	1) The input current of the outdoor unit is detected in the inverter section of the outdoor unit. 2) According to the detected outdoor temperature, the specified value of the current is selected. 3) Whether the current value exceeds the specified value or not is judged. 4) If the current value exceeds the specified value, this function reduces the compressor speed and controls speed up to the closest one commanded from the indoor unit within the range which does not exceed the specified value.



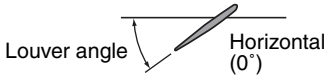
Outdoor temp.	Cooling current release value	Heating current release value
40˚C / 16˚C / 39˚C	7.5 A	8.3 A
11˚C / 15.5˚C	8.7 A	
10.5˚C		9.4 A
		10.5 A

Item	Operation flow and applicable data, etc.	Description
6. Release protective control by temperature of indoor heat exchanger	**<In cooling/dry operation>** (Prevent-freezing control for indoor heat exchanger) In cooling/dry operation, the sensor of indoor heat exchanger detects evaporation temperature and controls the compressor speed so that temperature of the heat exchanger does not exceed the specified value.	1) When temperature of the indoor heat exchanger drops below 5°C, the compressor speed is reduced. (P zone) 2) When temperature of the indoor heat exchanger rises in the range from 6°C to under 7°C, the compressor speed is kept. (Q zone) 3) When temperature of the indoor heat exchanger rises to 7°C or higher, the capacity control operation returns to the usual control in cooling operation. (R zone)
		
	<In heating operation> (Prevent-overpressure control for refrigerating cycle) In heating operation, the sensor of indoor heat exchanger detects condensation temperature and controls the compressor speed so that temperature of the heat exchanger does not exceed the specified value.	1) When temperature of the indoor heat exchanger rises in the range from 52°C to 55°C, the compressor speed is kept. (Q zone) When temperature of the indoor heat exchanger drops in the range from 48°C to under 55°C, the compressor speed is kept. (Q zone) 2) When temperature of the indoor heat exchanger rises to 55°C or higher, the compressor speed is reduced. (P zone) 3) When temperature of the indoor heat exchanger does not rise to 52°C, or when it drops below to 48°C, the capacity control operation returns to the usual control in heating operation. (R zone)
		

Item	Operation flow and applicable data, etc.	Description
7. Winding/Coil heating control	When the outdoor temperature is low, the windings/coils are heated to ensure compressor reliability.  	Winding/Coil heating is performed when the following conditions are met. **Condition 1 :** When the discharge sensor temperature (Td) is less than 30°C. **Condition 2 :** When the outdoor sensor temperature (To) is as shown in the left figure.
8. Defrost control (Only in heating operation)	(This function removes frost adhered to the outdoor heat exchanger.) The temperature sensor of the outdoor heat exchanger (Te sensor) judges the frosting status of the outdoor heat exchanger and the defrost operation is performed with 4-way valve reverse defrost system.  * The minimum value of Te sensor 10 to 15 minutes after start of operation is stored in memory as Te0 and Te1. (–10°C < Te1 ≤ 10°C) **Table 1** **A zone** — When Te0 - TE ≥ 2.5 continued for 2 minutes in A zone, defrost operation starts. **B zone** — When the operation continued for 2 minutes in B zone, defrost operation starts. **C zone** — When Te0 - TE ≥ 3 continued for 2 minutes in C zone, defrost operation starts. **D zone** — When the operation continued for 2 minutes in D zone, defrost operation starts. **E zone** — When Te1 - TE ≥ 1 continued for 2 minutes in E zone, defrost operation starts.	The necessity of defrost operation is detected by the outdoor heat exchanger temperature. The conditions to detect the necessity of defrost operation differ in A, B, C, D or E zone each. (Table 1) **<Defrost operation>** • Defrost operation in A to E zones 1) Stop operation of the compressor for 30 seconds. 2) Invert (OFF) 4-way valve 10 seconds after stop of the compressor. 3) The outdoor fan stops at the same time when the compressor stops. 4) When temperature of the indoor heat exchanger becomes 38°C or lower, stop the indoor fan. **<Finish of defrost operation>** • Returning conditions from defrost operation to heating operation 1) Temperature of outdoor heat exchanger rises to +8°C or higher. 2) Temperature of outdoor heat exchanger is kept at +5°C or higher for 80 seconds. 3) Defrost operation continues for 10 minutes. **<Returning from defrost operation>** 1) Stop operation of the compressor for approx. 60 seconds. 2) Invert (ON) 4-way valve approx. 40 seconds after stop of the compressor. 3) The outdoor fan starts rotating at the same time when the compressor starts.

Item	Operation flow and applicable data, etc.	Description
9. Louver control	This function controls the air direction of the indoor unit.	
1) Louver position	• The position is automatically controlled according to the operation mode (COOL/HEAT). • The set louver position is stored in memory by the microcomputer, and the louver returns to the stored position when the next operation is performed. (Cooling/heating memory position)	

The angle of the louver is indicated as the horizontal angle is 0°.
When the louver closes fully, it directs approx. 10° upward.



1) Louver position in cooling operation`

Cooling operation/AUTO (COOL)	Powerful
Initial setting of “Cooling storage position” Louver : Directs downward (23˚) ∗1	“Cooling storage position” Louver : Directs downward (34˚)

∗1 When the indoor humidity is high (Hu sensor valve) ≥ 70%), the compressor speed is 23 rps or more and the position of the louver is less than 29°, the louver moves to 29° to prevent the air outlet from dew drop. And the louver can’t move to less than 29°.
When the indoor humidity becomes low or the compressor speed becomes less than 23 rps, the louver returns to the storage position.

2) Louver position in heating operation

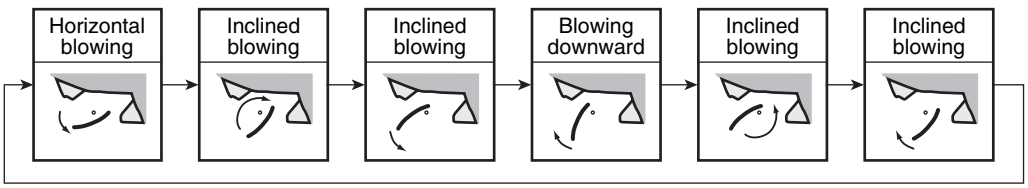
Heating operation/AUTO (HEAT)	Powerful
Initial setting of “Heating storage position” Louver : Directs downward (72˚)	“Heating storage position” Louver : Directs downward (58˚)

SLEEP MODE operation	
In case that the following temperature is obtained during 12 minutes or 12 to 25 minutes from start of heating operation: Room temperature (TA) < Set temperature (Tsc) –3.0	In case that the following temperature is obtained during 12 to 25 minutes from start of heating operation: Room temperature (TA) ≥ Set temperature (Tsc) –3.0 or when 25 minutes or more passed from start of heating operation.
“Heating storage position” Louver : Directs downward (72˚)	“Cooling storage position” Louver : Directs downward (23˚)

3) Louver position in dry operation

Dry operation
Initial setting of “Cooling storage position” Louver : Directs downward (23˚)*1

2) Air direction adjustment

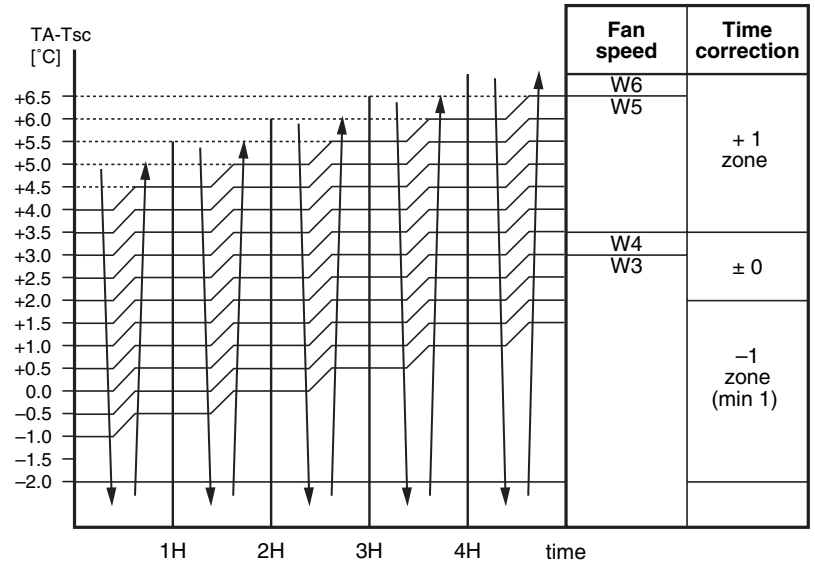


• The louver position can be arbitrarily set up by pushing [FIX] button.

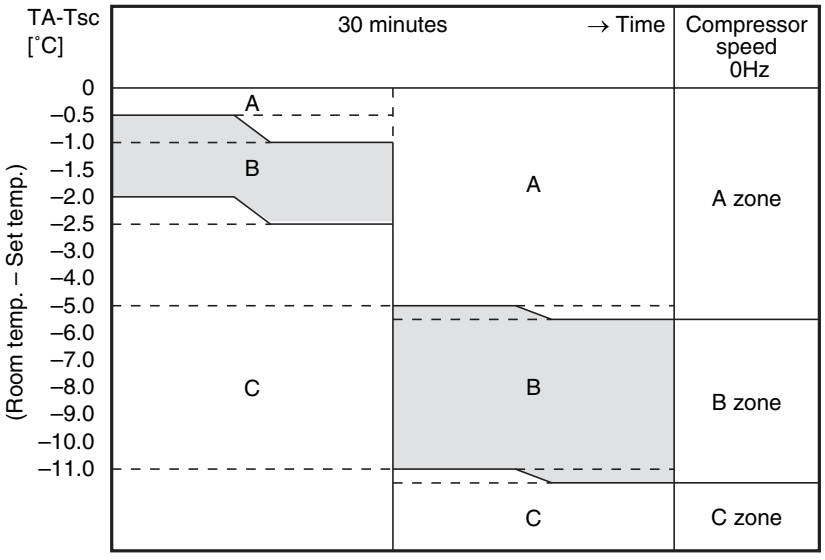
3) Swing

1) When pushing [SWING] button during operation, the louver starts swinging.
2) Each time you push the SWING button, you can change the swing mode.
(Vertical swing → Horizontal swing → Vertical and Horizontal swing ® Stop swinging)
• Swing operation is performed in width 35° with the stop position as the centre.
• If the stop position exceeds either upper or lower limit position, swing operation is performed in width 35° from the limit which the stop position exceeded.

Item	Operation flow and applicable data, etc.	Description
10. SLEEP MODE operation	When pushing [SLEEP MODE] button on the remote controller, a quiet and mild operation is performed by reducing the fan speed and the compressor speed. **<Cooling operation>** This function operates the air conditioner with the difference between the set and the room temperature as shown in the following figure. The time correction is performed for 8 minutes each.	**<Cooling operation>** 1) The indoor fan speed is controlled between W6 and W3. The compressor speed in control as shown in the left figure. 2) The set temperature increased 0.5°C per hour up to 2°C starting from the set temperature when SLEEP MODE has been received.



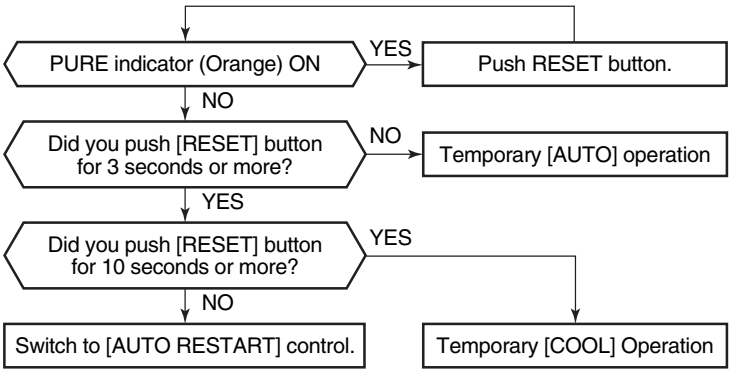
<Heating operation>



<Heating operation>

1) The indoor fan speed is controlled within (W7) as maximum value.
2) The louver position is set horizontally (Standard cooling position) when the room temperature comes close to the set temperature or when 25 minutes passed after starting SLEEP MODE operation.

Item	Operation flow and applicable data, etc.	Description
11. Temporary operation	Pushing [RESET] button starts the temporary operation of [AUTO] operation. When keeping [RESET] button pushed for 10 seconds or more, the temporary [COOL] operation is performed.	1) When pushing [RESET] button, the temporary [AUTO] operation starts. 2) When keeping [RESET] button pushed for 3 seconds or more, “beep, beep, beep” sound is heard and [AUTO RESTART] control is changed. 3) When keeping [RESET] button pushed for 10 seconds or more, “beep” sound is heard and the temporary [COOL] operation starts. 4) If the filter lamp goes on, push [RESET] button to go off the filter lamp, and then push [RESET] button again. 5) To stop the temporary operation, push the button again.



12. Air purifying control

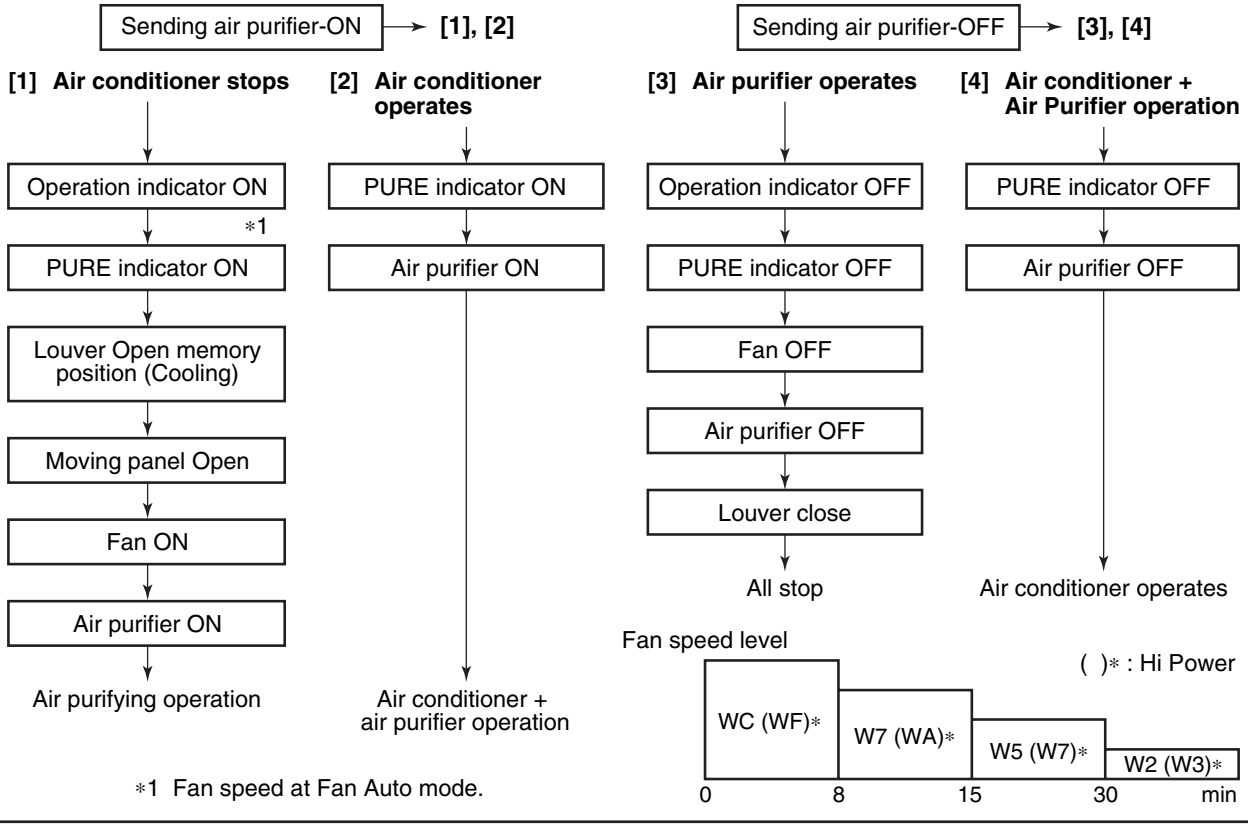
Present status \ Operation button	PURE button	Air conditioner
Stop	Air purifier	AC operation*
Air purifier only	Stop (All)	AC + Air purifier
Air conditioner	AC + Air purifier	All stop
Joint use of AC and air purifier	AC operation	All stop

	Louver swing is available	Fan speed ∗1
Air purifying operation	Cooling position	AUTO, L, L+, M, M+, H
AC + Air purifying operation	Follows to AC operation	Follows to AC operation

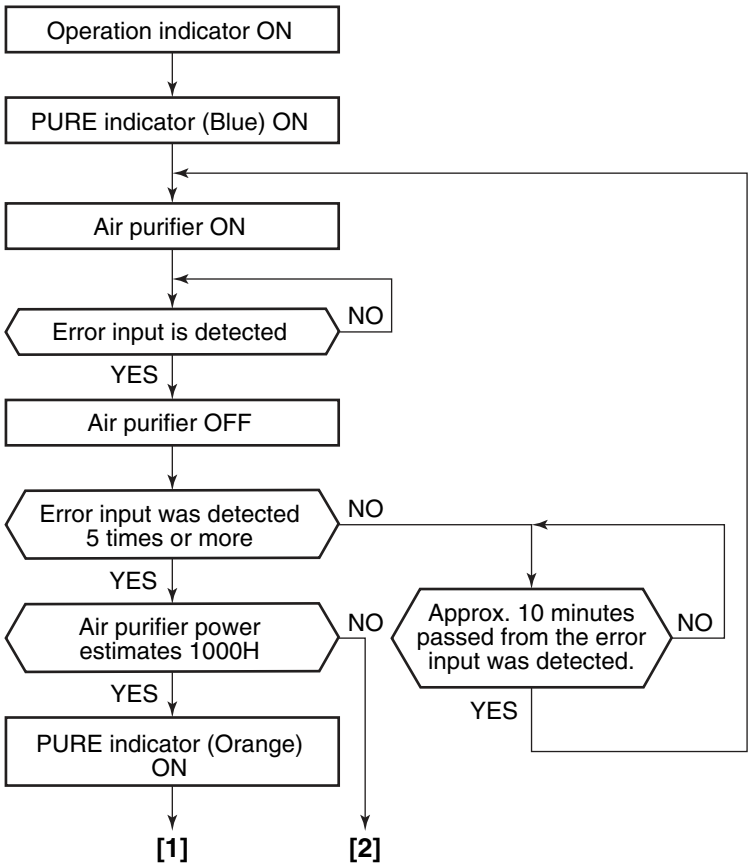
1. Purpose

This function generates negative ion while cleaning the air in the room.
The air purifying control function is to alert the user that something is wrong in the ionizing or air purifying operation.
If air purifier-ON signal is received while the air conditioner stops, the air purifier starts operation, and if it is received while the air conditioner operates, the air conditioner and the air purifier start operation.
The air ion generator operates linked with the air purifying operation.

NOTE When the previous operation was the operation of air conditioner + air purifier, an operation of air conditioner + air purifier starts by pushing AC button on the remote controller. (Operation of air conditioner + air purifier is stored in memory.)

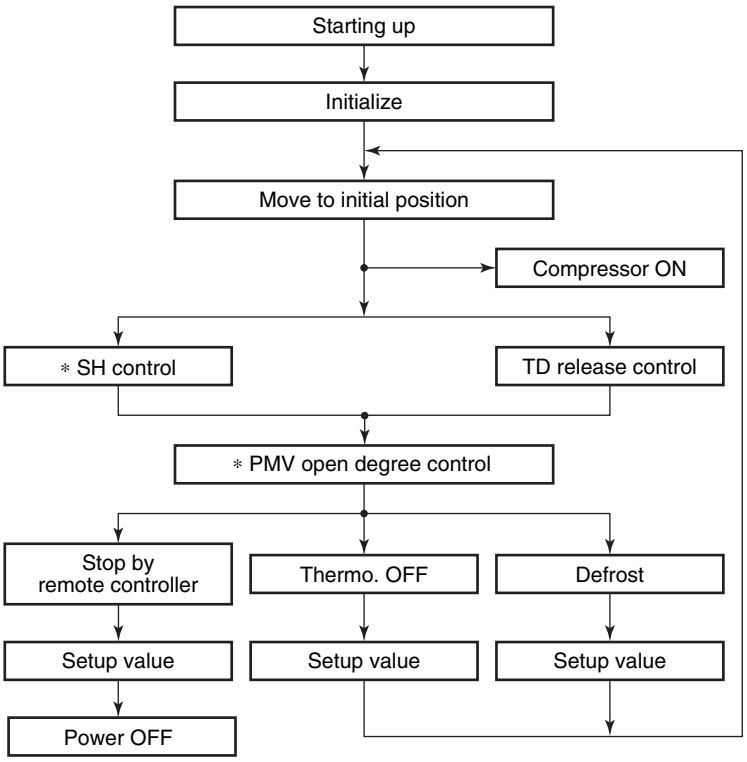


∗1 Fan speed at Fan Auto mode.

Item	Operation flow and applicable data, etc.	Description
12. Air purifying control (Continued)	Air purifying operation  **[1]** Reset by RESET button. **[2]** Reset by RESET button or by the stop direction from the remote controller. **NOTE** When the breaker is turned [ON] or RESET button is pushed while the FILTER indicator is turned on, the air purifier is not turned on until the integrated operation time of the indoor fan exceeds 1 hour after operation start. It is the safety measures considering an incomplete drain when electric dust collector has been cleaned with water.	**2. Description** Error is determined to have occurred (indicated by the PURE indicator (Orange) in the following two cases. 1) When the panel switch has been set to OFF by the opening of the air inlet grill ,etc. 2) When an abnormal discharge caused by a symptom such as the build-up of dirt has been detected while the air purifier is ON. **NOTE** The above case 1) or 2) is deemed to have occurred when the action concerned continues for more than one second. **3. Operation** The sequence that PURE indicator (Orange) is turned on are described in the following flowchart. 1) If the air purifying error input was detected by 5 times or under, turn on the purifier again approx. 10 minutes after and judge it again. 2) If the air purifying error input was detected by 5 times or more and 1000 H timer counts up, determine the error and turn on the PURE indicator (Orange). 3) The FILTER indicator keeps lighting even if the operation is stopped by the remote controller. The timer is stored in memory of the microcomputer, and the operation time is cleared by filter RESET button on the indoor unit. (FILTER indicator goes off.)

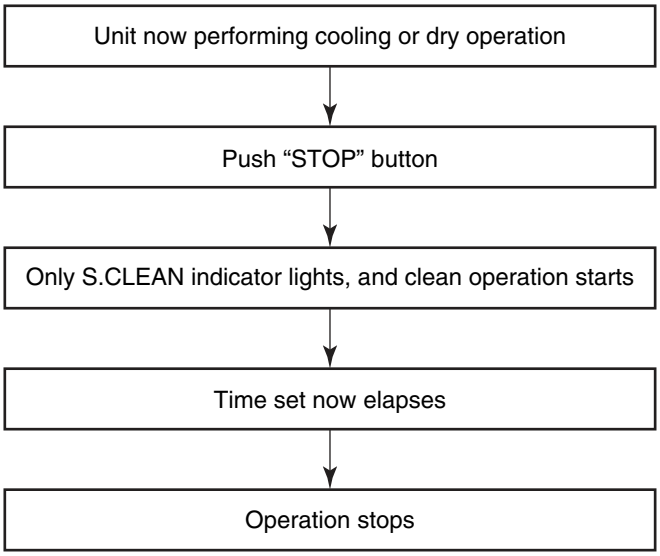
Item	Operation flow and applicable data, etc.	Description
13. Discharge temperature control		**1. Purpose** This function detects error on the refrigerating cycle or error on the compressor, and performs protective control. **2. Operation** • Control of the compressor speed The speed control is performed as described in the left table based upon the discharge temperature.
14. Pulse motor valve (P.M.V.) control	This function controls throttle amount of the refrigerant in the refrigerating cycle. According to operating status of the air conditioner, this function also controls the open degree of valve with an expansion valve with pulse motor.	1) When starting the operation, move the valve once until it fits to the stopper. (Initialize) ∗ In this time, “Click” sound may be heard. 2) Adjust the open degree of valve by super heat amount. (SH control) 3) If the discharge temperature was excessively up, adjust the open degree of valve so that it is in the range of set temperature. (Discharge temp. control) 4) When defrost operation is performed, the open degree of PMV is adjusted according to each setup conditions during preparation for defrost and during defrost operation (4-way valve is inversed.). 5) When turning off the compressor by thermo. OFF or STOP by remote controller, the open degree of the PMV is adjusted to the setup value.

Td value	Control operation
117°C	Judges as an error and stops the compressor.
112°C	Reduce the compressor speed.
108°C	Reduce slowly compressor speed.
105°C	Keeps the compressor speed.
98°C	If the operation is performed with lower speed than one commanded by the serial signal, speed is slowly raised up to the commanded speed.
	Operates with speed commanded by the serial signal.



∗ SH (Super Heat amount) =
Ts (Temperature of suction pipe of the compressor) –
Tc or Te (Heat exchanger temperature at evaporation side)
∗ PMV: Pulse Motor Valve

Item	Operation flow and applicable data, etc.	Description
15. Clean operation		**1. Purpose** The clean operation is to minimize the growth of mold, bacteria etc. by running the fan and drying so as to keep the inside of the air conditioner clean. **Clean operation** When the cooling or dry operation shuts down, the unit automatically starts the clean operation which is then performed for the specified period based on duration of the operation which was performed prior to the shutdown, after which the clean operation stops. (The clean operation is not performed after a heating operation.) **2. Operation** 1) When the stop signal from the remote controller is received, the S.CLEAN indicator (Orange) on the main body lights, and the clean operation starts. (Neither the OPERATION indicator nor the PURE indicator light.) 2) The period of the clean operation is determined by the duration of the operation performed prior to the reception of the stop code. 3) After the clean operation has been performed for the specified period, the unit stops operating.


Unit now performing cooling or dry operation
Push “STOP” button
Only S.CLEAN indicator lights, and clean operation starts
Time set now elapses
Operation stops

- During clean operations: The louver opens slightly. The indoor fan operates continuously at a speed of 450 rpm.

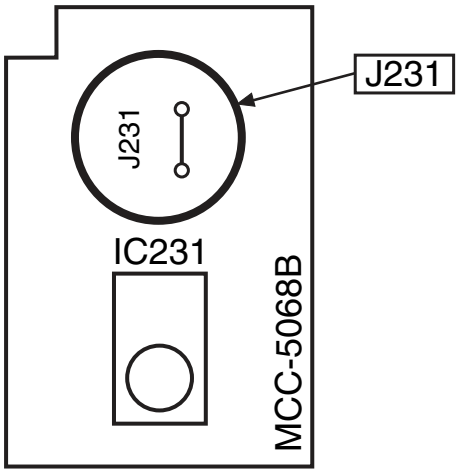
  Clean operation times

Clean operation times

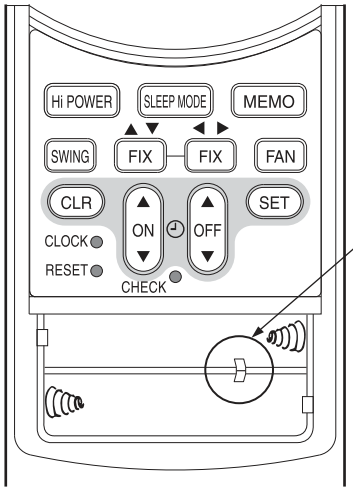
Operation mode	Operation time	Clean operation time
Cooling: Auto (cooling) Dry	Up to 10 minutes	No clean operation performed (0 minutes)
	10 minutes or longer	4 hours
Heating: Auto (heating)	No clean operation performed	
Auto (fan only)		
Shutdown		

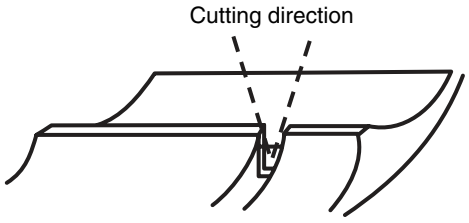
- To stop an ongoing clean operation at any time

  Push the start/stop button on the remote controller twice during the clean operation.(After pushing the button for the first time, push it for the second time without delay (within 10 minutes).)

Item	Operation flow and applicable data, etc.	Description
16. Clean operation cancel	**Setting the clean operation cancel** Add J231 of the wireless unit P.C. board assembly. ∗ This cancels the auto restart function. ↓ Hold down the [RESET] button on the indoor unit for at least 3 seconds but not more than 10 seconds. ↓ The indoor unit's buzzer emits three beeps. ↓ This completes the clean operation cancel setting. **Setting the clean operation** Hold down the [RESET] button on the indoor unit for at least 3 seconds but not more than 10 seconds. ↓ The indoor unit's buzzer emits three beeps, and the OPERATION indicator flashes at 5 Hz intervals. ↓ This completes the clean operation setting. **Indoor P.C. board**  	⚠CAUTION ∗ J231 will be near the MCU so take steps to ensure that it will not be exposed to excessive levels of heat. Also take care to avoid solder bridging with the surrounding components. **NOTE** Once J231 is added, the [RESET] button on the unit is designated for CLEAN OPERATION (Set/Cancel), therefore the [RESET] button cannot be used for the selection (Set/ Cancel) of AUTO RESTART function (Refer to **9-3. Auto Restart Function**).

Item	Operation flow and applicable data, etc.	Description
17. Select switch on remote controller	Push the operation button on the remote controller. ↓ Both indoor units start operation. → YES → Select "B" as the setting for one of the two indoor units and for the remote controller. (See below for details.) NO ↓ Unnecessary set [Remote controller select]	**1. Purpose** This operation is to operate only one indoor unit using one remote controller. **2. Description** When operating one indoor unit in a situation where two indoor units have been installed in the same room or nearby rooms, this operation prevents the remote controller signal from being received simultaneously by both units, thus preventing both units from operating. **3. Operation** The indoor unit on which the remote controller selection has been set to B receives the signal of the remote controller also set to B. (At the factory the remote controller selection is set to A on all the indoor units. There is no A setting display.)



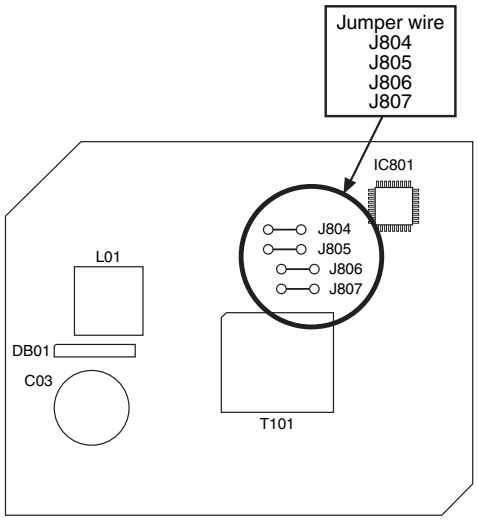


Setting the remote controller

Switching between A and B is enabled by cutting the jumper wire inside the battery box using pliers.

1) Slide open the remote controller cover and remove the batteries.
2) Cut the jumper wire inside the battery compartment using nippers.
   - The jumper wire should not remain in contact after being cut. Also, be careful not to let plastic scraps, jumper wire cuttings or other debris enter the inside of the remote controller.
3) Insert the batteries. "B" appears in the remote controller display.
   * Even after the jumper wire has been cut, switching between A and B is still possible by pushing the CHECK button and FIX button together.
     The A or B setting, which was switched by pushing the CHECK button and FIX (▲/▼) button together, is restored to the setting established prior to the switching when the battery is replaced or the RESET button is pushed.
   * When switching between settings "A" and "B", always switch the indoor unit board and the remote controller as a pair. (Otherwise, the indoor unit will not accept the remote controller's signals.)
4) Push the RESET button (Indoor unit) to start automatic operation.
5) Push the ⏻ button of the remote controller that was set in step 1 to stop the air conditioner.
   (This operation will change the setting to "B".)
6) Check that the remote controller operates the indoor unit.

Item	Operation flow and applicable data, etc.	Description
18. Set temperature correction	**Indoor Control P.C. Board (Factory Default)**	**1. Purpose** When the difference between the set temp. of the remote controller and the room temp. is wide due to the installation condition, etc, the set temp. is corrected. (HEAT operation only) **2. Description** The set temp. received from the remote controller is corrected. The correct value from –2°C to +4°C is changed by the jumper wire on P.C. board of the indoor microcomputer.



In HEAT Operation

Jumper wire setup		HEAT shift value	
J804	J805		
×	×	–2	
×	○	+4	
○	×	+2	
○	○	0	← At shipment

○ : With Jumper wire
: Cut Jumper wire

9-3. Auto Restart Function

This indoor unit is equipped with an automatic restarting function which allows the unit to restart operating with the set operating conditions in the event of a power supply being accidentally shut down.

The operation will resume without warning 3 minutes after power is restored.

This function is not set to work when shipped from the factory. Therefore it is necessary to set it to work.

9-3-1. Setting the Auto Restart Function

To set the auto restart function, proceed as follows:

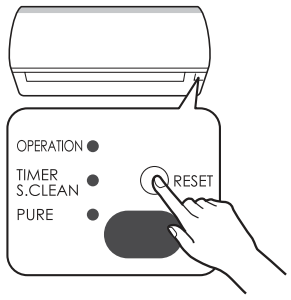
The power supply to the unit must be on ; the function will not set if the power is off.

Push the [RESET] button located in the center of the front panel continuously for 3 seconds.

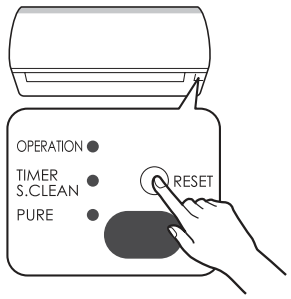
The unit receives the signal and beeps 3 times.

The unit then restarts operating automatically in the event of power supply being accidentally shut down.

• When the unit is standby (Not operating)

Operation	Motions
Push [RESET] button for more than 3 seconds. (Less than 10 seconds)  	The unit is on standby. ↓ (Push [RESET] button for more than 3 seconds.) The unit starts to operate. The green indicator is on. ↓ After approx. 3 seconds, The unit beeps 3 times and continues to operate. **The green indicator flashes for 5 seconds.** If the unit is not required to operate at this time, push [RESET] button once more or use the remote controller to turn it off.

• When the unit is in operation

Operation	Motions
Push [RESET] button for more than 3 seconds. (Less than 10 seconds)  	The unit is in operation. The green indicator is on. ↓ (Push [RESET] button for more than 3 seconds.) The unit stops operating The green indicator is turned off. ↓ After approx. 3 seconds, The unit beeps 3 times. **The green indicator flashes for 5 seconds.** If the unit is required to operate at this time, push [RESET] button once more or use the remote controller to turn it on.

NOTE :

- After restarting the air conditioner by the AUTO RESTART OPERATION, the louver swing (AUTO) operation doesn't resume.
- While the PURE indicator (Orange) is on, the RESET button has the function of air purifier reset button.

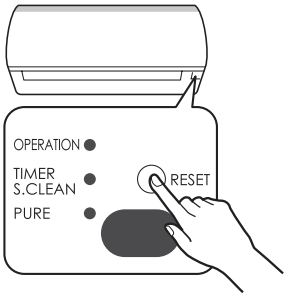
9-3-2. Cancel the Auto Restart Function

To cancel auto restart function, proceed as follows :

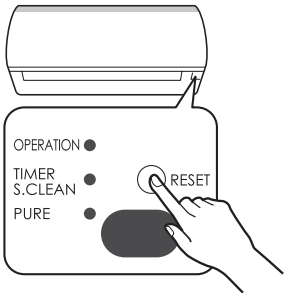
Repeat the setting procedure : the unit receives the signal and beeps 3 times.

The unit will be required to be turned on with the remote controller after the main power supply is turned off.

• When the system is on stand-by (not operating)

Operation	Motions
Push [RESET] button for more than 3 seconds. (Less than 10 seconds)  	The unit is on standby. ↓ (Push [RESET] button for more than 3 seconds.) The unit starts to operate. The green indicator is on. ↓ After approx. 3 seconds, The unit beeps 3 times and continues to operate. If the unit is not required to operate at this time, push [RESET] button once more or use the remote controller to turn it off.

• When the system is operating

Operation	Motions
Push [RESET] button for more than 3 seconds. (Less than 10 seconds)  	The unit is in operation. The green indicator is on. ↓ (Push [RESET] button for more than 3 seconds.) The unit stops operating. The green indicator is turned off. ↓ After approx. 3 seconds, The unit beeps 3 times. If the unit is required to operate at this time, push [RESET] button once more or use the remote controller to turn it on.

9-3-3. Power Failure During Timer Operation

When the unit is turned off because of power failure during timer operation, the timer operation is cancelled.

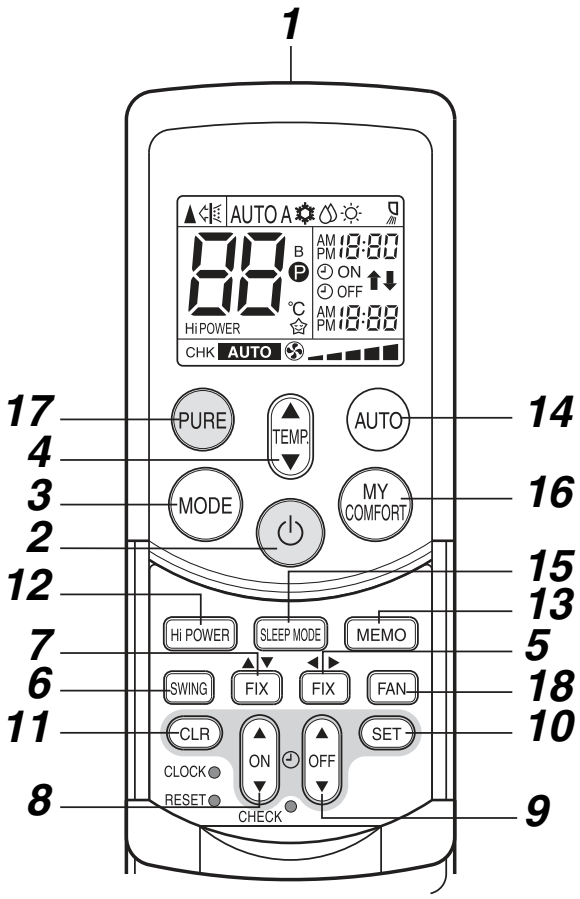
In that case, set the timer operation again.

NOTE :

The Everyday Timer is reset while a command signal can be received from the remote controller even if it stopped due to a power failure.

9-4. Remote Controller and Its Functions

9-4-1. Parts Name of Remote Controller



1 **Infrared signal transmitter**

Transmits signals to the indoor unit.

2 **⏻ button**

Push the button to start operation.
(A receiving beep is heard.)

Push the button again to stop operation.
(A receiving beep is heard.)

If the receiving beep isn't heard from the indoor unit, push the button again.

3 **Mode select button (MODE)**

Push this button to select a mode.

Each time you push the button, the modes cycle in order from A: Auto change over control, ☼ : Cool, 💧 : Dry, ☼ : Heat and back to A.
(A receiving beep is heard.)

4 **Temperature button (▲ TEMP ▼)**

▲ ...The temperature setting is raised to 30°C.

▼ ...The temperature setting is lowered to 17°C.
(A receiving beep is heard.)

5 **Set horizontal air flow button (FIX)**

Push this button to adjust the horizontal air flow direction. (A receiving beep is heard.)

6 **Set vertical air flow button (FIX)**

Push this button to adjust the vertical air flow direction. (A receiving beep is heard.)

7 **Auto louver button (SWING)**

Each time you push the SWING button, you can change the swing mode. (A receiving beep is heard.) (Vertical swing → Horizontal swing → Vertical and Horizontal swing → Stop swinging)
Push the button again to stop the swinging mode. (A receiving beep is heard.)

8 **ON timer button (ON)**

Use this button to change the clock and ON timer times.

To move up the time, push ▲ of the ON ▲ ON ▼ button.

To move down the time, push ▼ of the ON ▲ ON ▼ button.

9 **OFF timer button (OFF)**

Use this button to change the OFF timer times.

To move up the time, push ▲ of the OFF ▲ OFF ▼ button.

To move down the time, push ▼ of the OFF ▲ OFF ▼ button.

10 **Reserve button (SET)**

Push this button to store the time settings.
(A receiving beep is heard.)

11 **Cancel button (CLR)**

Push this button to cancel the ON timer and OFF timer. (A receiving beep is heard.)

12 **High power button (Hi POWER)**

Push this button to start high power operation.

13 **Memory button (MEMO)**

Push this button to ready for storing the settings. Hold down the button for 3 seconds or more to store the Ⓟ mark is displayed.

14 **Automatic operation button (AUTO)**

Push this button to operate the air conditioner automatically. (A receiving beep is heard.)

15 **SLEEP MODE button**

Push this button to start sleep mode.

16 **MY COMFORT button**

Push this button to operate the air conditioner according to the settings stored using the MEMO button.

17 **PURE button (PURE)**

Push this button to start the electrical air purifying operation.
Push the button again to stop operation.

18 **Fan speed button (FAN)**

Push this button to select the fan speed.

When you select AUTO, the fan speed is automatically adjusted according to the room temperature.

You can also manually select the desired fan speed from five available settings.

(LOW ▁, LOW+ ▁▂, MED ▁▂▃, MED+ ▁▂▃▄, HIGH ▁▂▃▄▅) (A receiving beep is heard.)

9-4-2. Name and Functions of Indications on Remote Controller

[Display]

All indications, except for the clock time indicator, are displayed by pushing the ⏻ button.

1 **Transmission mark**

This transmission mark ▲ indicates when the remote controller transmits signals to the indoor unit.

2 **Mode indicator**

Indicates the current operation mode.
(AUTO : Automatic control, A : Auto changeover control, ☼ : Cool, 💧 : Dry, ☀ : Heat)

3 **Temperature indicator**

Indicates the temperature setting. (17°C to 30°C)

4 **PURE indicator**

Shows that the electrical air purifying operation is in progress.

5 **FAN speed indicator**

Indicates the selected fan speed.

AUTO or five fan speed levels (LOW ▁, LOW+ ▁▂, MED ▁▂▃, MED+ ▁▂▃▄, HIGH ▁▂▃▄▅) can be shown.

Indicates AUTO when the operating mode is either AUTO or 💧 : Dry.

6 **TIMER and clock time indicator**

The time setting for timer operation or the clock time is indicated.

The current time is always indicated except during TIMER operation.

7 **Hi POWER indicator**

Indicates when the Hi POWER operation starts.

Push the Hi POWER button to start and push it again to stop the operation.

8 **Ⓟ (MEMORY) indicator**

Flashes for 3 seconds when the MEMO button is pressed during operation.

The Ⓟ mark is shown when holding down the button for 3 seconds or more while the mark is flashing. Push another button to turn off the mark.

9 **SLEEP mode indicator**

Indicates when the SLEEP MODE is in activated.

Push the SLEEP MODE button to start and push it again to stop operation.

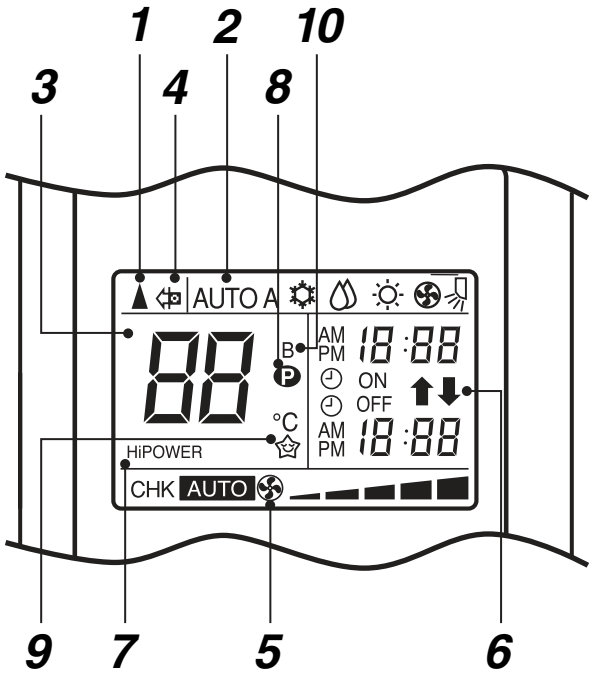
10 **A, B change indicator remote controller**

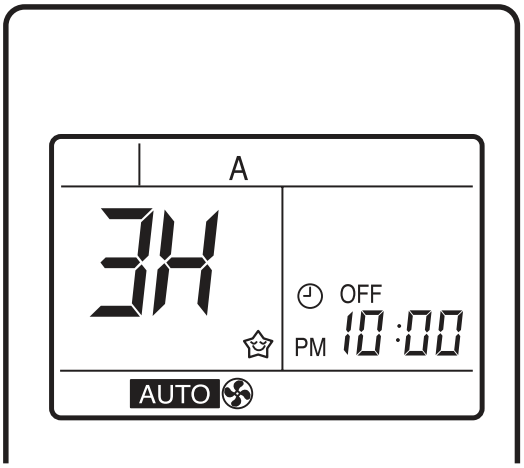
When the remote controller switching function is set, “B” appears in the remote controller display. (When the remote controller setting is “A”, there is no indication at this position.)

NOTE:

Remote controller switching function

- If two indoor units are installed in the same room or adjoining rooms, both units may start and stop at the same time when the remote controller is operated.
  This can be prevented by setting the switching function so that each indoor unit is operated only by the corresponding remote controller.





9-5. Hi-POWER Mode

When [Hi POWER] button is pushed while the indoor unit is in Auto, Cooling or Heating operation, Hi POWER mark is indicated on the display of the remote controller and the unit operates according to the present operation mode as described below.

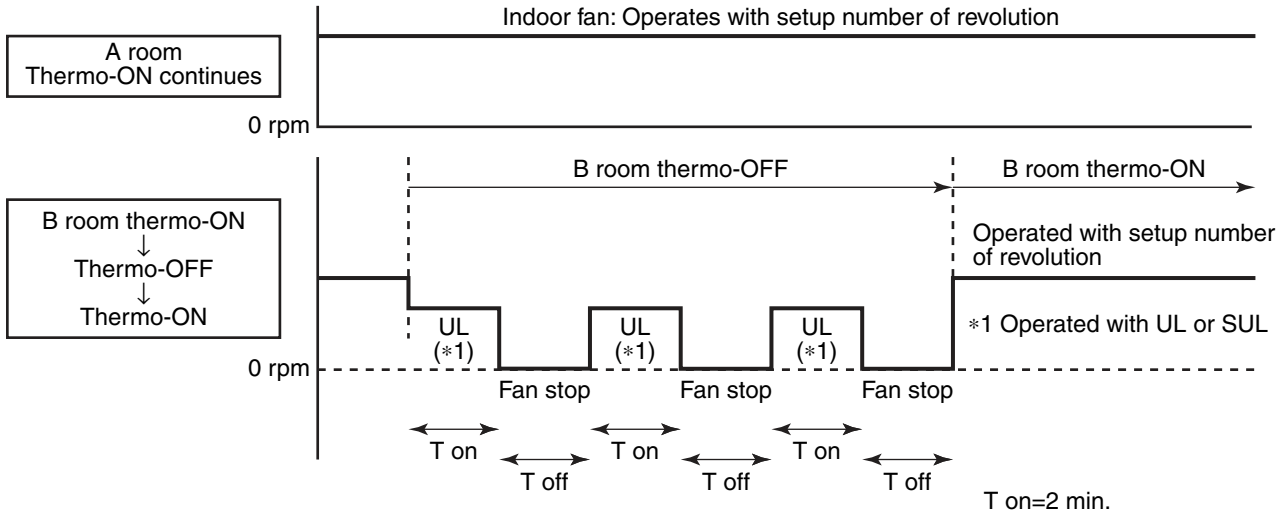
1. **Automatic operation**
   The preset temperature changes according to the operation mode selected.
   In the Cooling operation, the preset temperature drops by 1°C.
   In the Heating operation, the preset temperature increases by 2°C.
2. **Cooling operation (Manual)**
   The preset temperature drops 1°C.
   (The value of the preset temperature on the remote controller does not change.)
3. **Heating operation (Manual)**
   The preset temperature increases 2°C.
   (The value of the preset temperature on the remote controller does not change.)
4. **The Hi POWER mode can not be set in Dry operation**
5. **Release of Hi POWER mode**
   Push [Hi POWER] button on the remote controller again.

9-6. Intermittent Operation Control for Indoor Fans of the Indoor Unit at Thermo-off Side in Heating Operation

While heating operation is executed in two rooms, if room temperature reached the setup temperature in one room and thermo-off occurred, the following operations start. (Refer to the figure below.)

1. The indoor unit of the room (A room) in which thermo-off did not occur starts a continuous operation with the setup number of revolution.
2. The indoor unit of the room (B room) in which thermo-off occurred starts intermittent operation of the indoor fan.
   The indoor fan operates with number of revolution of UL or SUL. Fan-ON time is 2 minutes and Fan-OFF time is 2 to 4 minutes.
   However if temperature of the indoor heat exchanger becomes over 55°C or more in B room, the indoor fan stops the intermittent operation and starts continuous operation.

While heating operation is executed in 2 rooms, if room temperature reached the setup temperature in both rooms and thermo-off occurred, both indoor units start intermittent operation of the indoor fan.



∗ In case which Tc sensor temperature exceeds 55˚C in B room, the fan stops intermittent operation and starts continuous operation with UL or SUL (∗1).

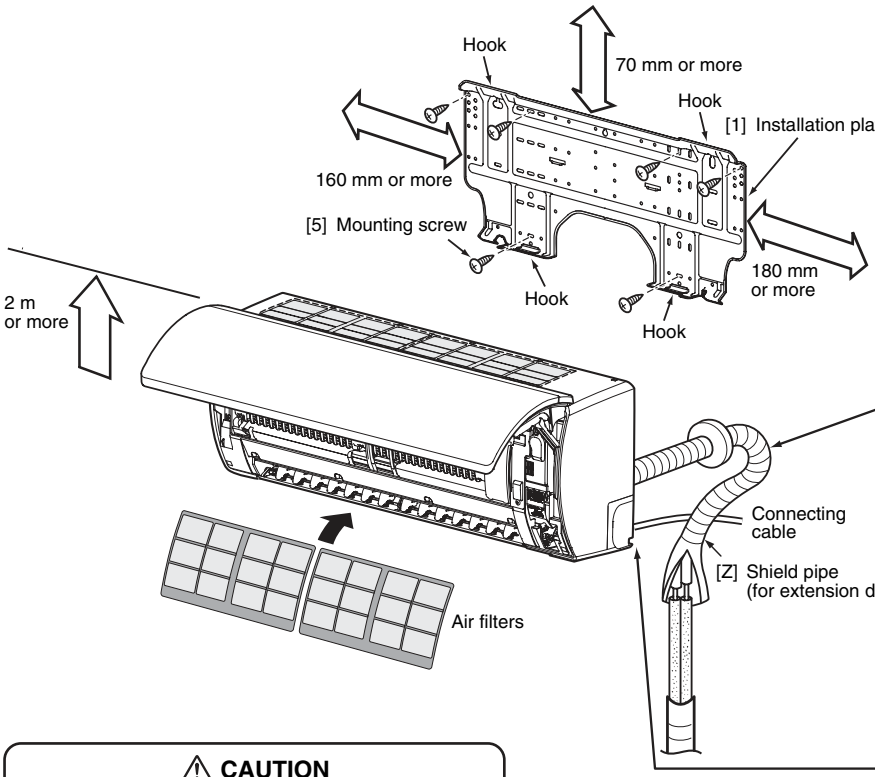
T on=2 min.

T off time	
To < 5˚C	2 min.
5 ≤ To < 10	3 min.
10 ≤ To	4 min.

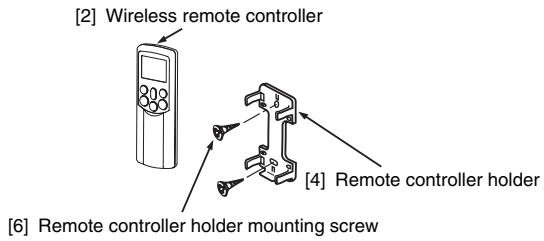
10. INSTALLATION PROCEDURE

10-1. Safety Cautions

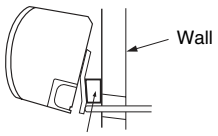
The indoor unit shall be installed so that the top of the indoor unit is positioned at least 2 m high.
Also, avoid putting anything on the top of the indoor unit.



⚠ CAUTION
Install in rooms that are 5 m³ or larger.
If a leak of refrigerant gas occurs inside the room, an oxygen deficiency can occur.

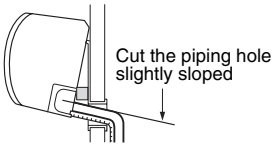


For the rear left and left piping



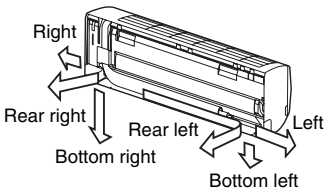
Insert the cushion between the indoor unit and wall, and tilt the indoor unit for better installation work.

Do not allow the drain hose to become slack.

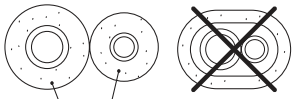


Make sure the drain hose is sloped downward.

The auxiliary piping can be connected at the left, rear left, rear right, right, bottom right or bottom left as shown below.



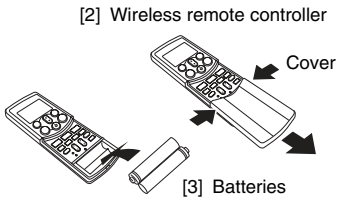
Insulate the refrigerant pipes separately, not together.



8 mm thick heat resisting polyethylene foam

Before installing the wireless remote controller

- With the remote controller cover removed, correctly load the supplied batteries while observing their polarity.



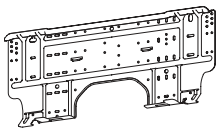
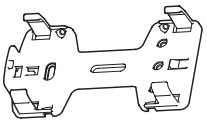
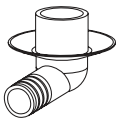
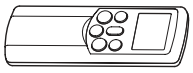
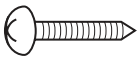
- If the system will be used in cooling mode when the outdoor temperature is below zero, take measures to ensure that the drain water does not freeze.
- When the outdoor unit is installed in a place that is always exposed to strong winds like on the coast or on a high story of a building, secure the normal fan operation using a duct or a wind shield.

10-2. Optional Parts, Accessories and Tools

10-2-1. Optional Installation Parts

Part Code	Parts name			Q'ty
[Y]	Refrigerant piping			1 ea.
	Indoor unit name	Liquid side (Outer diameter)	Gas side (Outer diameter)	
	RAS-M10PKVP-E, RAS-M13PKVP-E	6.35 mm	9.52 mm	
	RAS-M16PKVP-E	6.35 mm	12.7 mm	
[Z]	Shield pipe (for extension drain hose) (polyethylene foam, 8 mm thick)			1

10-2-2. Accessory and Installation Parts

Part No.	Part name (Q'ty)	Part No.	Part name (Q'ty)	Part No.	Part name (Q'ty)
[1]	 Installation plate × 1	[4]	 Remote controller holder × 1	[7]	 Drain nipple * × 1
[2]	 Wireless remote controller × 1	[5]	 Mounting screw Ø4 × 25L × 7	[8]	Water-proof rubber cap * × 2
[3]	Battery × 2	[6]	Remote controller holder mounting screw Ø3.1 × 16L × 2		

Parts marked with asterisk (*) are packaged with the outdoor unit.

<Others>

Name
Owner's manual (Indoor unit)
Installation manual (Indoor unit)
Installation manual (Outdoor unit)

This model is not equipped with an extension drain hose.

10-2-3. Installation/Servicing Tools

Changes in the product and components

In the case of an air conditioner using R410A, in order to prevent any other refrigerant from being charged accidentally, the service port diameter of the outdoor unit control valve (3-way valve) has been changed. (1/2 UNF 20 threads per inch)

- In order to increase the pressure resisting strength of the refrigerant piping flare processing diameter and size of opposite side of flare nuts has been changed. (for copper pipes with nominal dimensions 1/2 and 5/8)

New tools for R410A

New tools for R410A	Applicable to R22 model		Changes
Gauge manifold	×		As pressure is high, it is impossible to measure by means of conventional gauge. In order to prevent any other refrigerant from being charged, each port diameter has been changed.
Charge hose	×		In order to increase pressure resisting strength, hose materials and port size have been changed (to 1/2 UNF 20 threads per inch). When purchasing a charge hose, be sure to confirm the port size.
Electronic balance for refrigerant charging	○		As pressure is high and gasification speed is fast, it is difficult to read the indicated value by means of charging cylinder, as air bubbles occur.
Torque wrench (nominal diam. 1/2, 5/8)	×		The size of opposite sides of flare nuts have been increased. Incidentally, a common wrench is used for nominal diameters 1/4 and 3/8.
Flare tool (clutch type)	○		By increasing the clamp bar's receiving hole, strength of spring in the tool has been improved.
Gauge for projection adjustment	—	—	Used when flare is made by using conventional flare tool.
Vacuum pump adapter	○		Connected to conventional vacuum pump. It is necessary to use an adapter to prevent vacuum pump oil from flowing back to the charge hose. The charge hose connecting part has two ports-one for conventional refrigerant (7/16 UNF 20 threads per inch) and one for R410A. If the vacuum pump oil (mineral) mixes with R410A a sludge may occur and damage the equipment.
Gas leakage detector	×		Exclusive for HFC refrigerant.

- Incidentally, the "refrigerant cylinder" comes with the refrigerant designation (R410A) and protector coating in the U. S's ARI specified rose color (ARI color code: PMS 507).
- Also, the "charge port and packing for refrigerant cylinder" require 1/2 UNF 20 threads per inch corresponding to the charge hose's port size.

CAUTION

- Incorrect wiring connection may cause electrical parts to burn out.
- Be sure to comply with local regulations/codes when running the wire from outdoor unit to indoor unit. (Size of wire and wiring method etc.)
- Every wire must be securely connected.
- If incorrect or incomplete wiring is carried out, fire or smoke may result.
- Prepare the power supply for the exclusive use of the air conditioner.

10-3. Indoor Unit

10-3-1. Installation Place

- A place which provides enough spaces around the indoor unit as shown in the diagram.
- A place where there are no obstacle near the air inlet and outlet.
- A place which allows easy installation of the piping to the outdoor unit.
- A place which allows the front panel to be opened.
- The indoor unit shall be installed so that the top of the indoor unit is positioned at least 2m in height.
- Also, avoid putting anything on the top of the indoor unit.

Remote controller

- Should be placed where there are no obstacles, such as curtains, that may block the signal.
- Do not install the remote controller in a place exposed to direct sunlight or close to a heating source, such as a stove.
- Keep the remote controller at least 1 m away from the nearest TV set or stereo equipment. (This is necessary to prevent image disturbances or noise interference.)
- Do not install near high-frequency devices or wireless devices.
- The location of the remote controller should be determined as shown below.

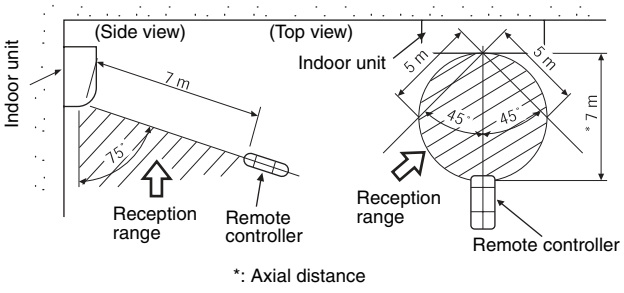


Fig. 10-3-1

10-3-2. Drilling and Mounting Installation Plate

Drilling

When installing the refrigerant pipes from the rear.

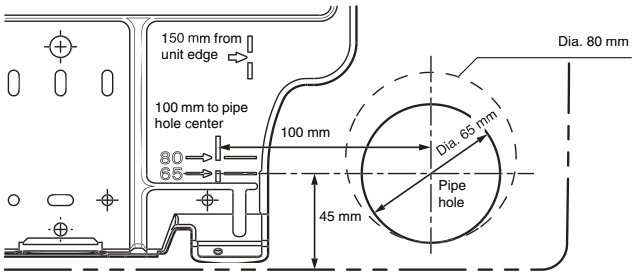


Fig. 10-3-2

1. Decide the installation plate mounting position on the wall.
2. Mark the corresponding pipe hole wall positions according to the positioning marks (⇨) on the installation plate.
3. Drill the pipe holes (Dia. 65 mm or Dia. 80 mm) slightly slanted downward to the outside.

NOTE:

- When drilling into a wall that contains a metal lath, wire lath or metal plate, be sure to use a pipe hole brim ring sold separately.
- The unit is designed to enable installation using holes of 65 mm in diameter.
  However, if installation is difficult, make holes that are 80 mm in diameter.

CAUTION

Completely fill in the gaps in the pipe holes with noncombustible material (such as putty) to prevent condensation and fire in the casing.

Mounting the installation plate

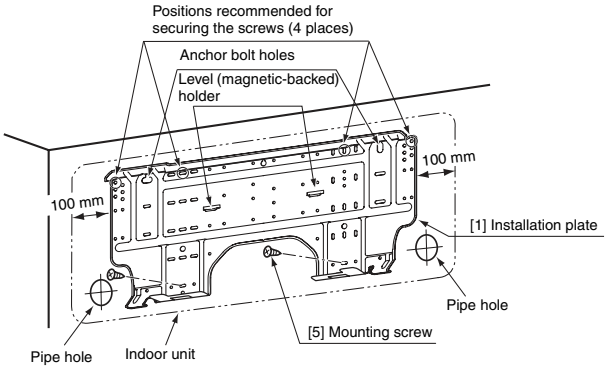


Fig. 10-3-3

Mounting the installation plate directly on a wall

1. Securely fit the installation plate onto the wall by screws with the upper and lower catches.
2. To mount the installation plate on a concrete wall use anchor bolts. Drill the anchor bolt holes as illustrated in the above figure.
3. Place the level at the top end of the installation plate, and check that the plate is horizontal.

CAUTION

When installing the installation plate with mounting screws, do not use anchor bolt holes.

Otherwise the unit may fall down and result in personal injury and property damage.

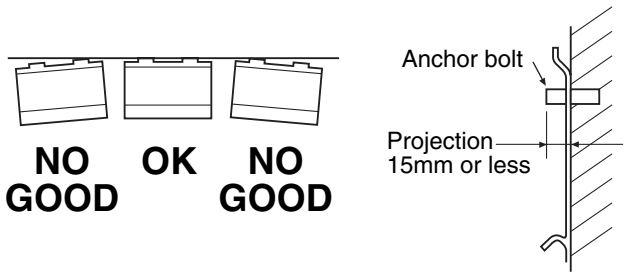


Fig. 10-3-4

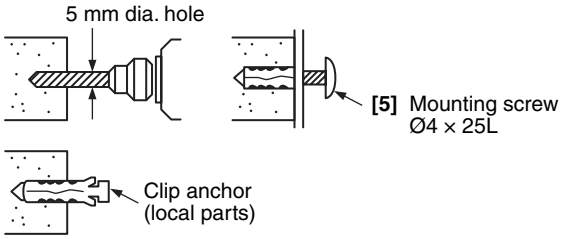


Fig. 10-3-5

CAUTION

Failure to securely install the unit may result in personal injury and/or property damage if the unit falls.

- In case of block, brick, concrete or similar type walls, drill 5 mm dia. holes in the wall.
- Insert clip anchors for the **[5]** mounting screws.

NOTE:

Install the installation plate using between 4 to 6 mounting screws, making sure all four corners are secure.

10-3-3. Electrical Work

1. The supply voltage must be the same as the rated voltage of the air conditioner.
2. Prepare a power source for the exclusive use of the air conditioner.

NOTE:

- Wire type: H07RN-F or 60245IEC66 (1.0 mm²)
- Make sure the wire length is sufficient before performing wiring work.

10-3-4. Wiring Connection

Connecting cable

Wiring the connecting cable can be carried out without removing the front panel.

1. Remove the air inlet grille.

   Open the air inlet grille upward and pull it toward you.
2. Remove the terminal cover and cord clamp.
3. Insert the connecting cable (or as according to local regulations/codes) into the pipe hole on the wall.
4. Pull the connecting cable through the cable slot on the rear panel so that it protrudes about 15 cm out of the front.
5. Insert the connecting cable fully into the terminal block and secure it tightly with screws.

   Make a loop with the earth wire under the terminal block and secure it with the earth screw.
6. Tightening torque: 1.2 N•m (0.12 kgf•m)
7. Secure the connecting cable with the cord clamp.
8. Attach the terminal cover and moving panel on the indoor unit.

CAUTION

- Be sure to refer to the wiring system diagram labelled inside the front panel.
- Check local electrical regulations for any specific wiring instructions or limitations.

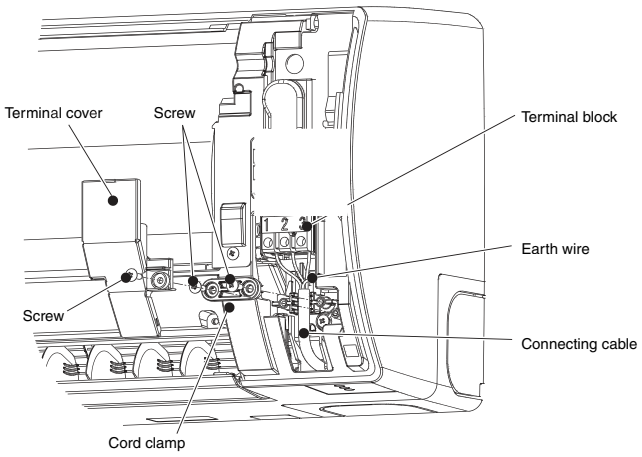


Fig. 10-3-6

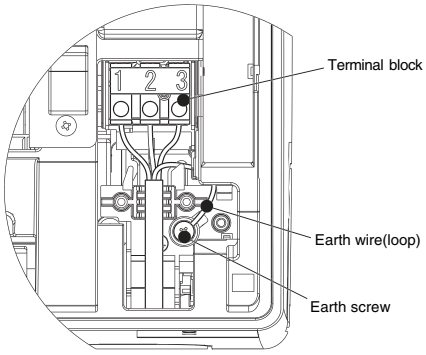


Fig. 10-3-7

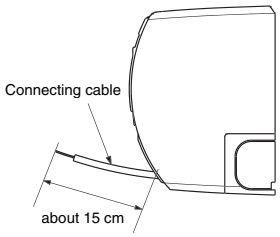


Fig. 10-3-8

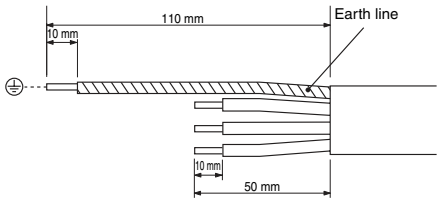


Fig. 10-3-9

NOTE:

- Connecting cable (Indoor unit/outdoor unit)
- Wire type: H07RN-F or 60245IEC66 (1.0 mm²)

10-3-5. Piping and Drain Hose Installation

Piping and drain hose forming

Since condensation results in machine trouble, make sure to insulate both the connecting pipes separately.
(Use polyethylene foam as insulating material.)

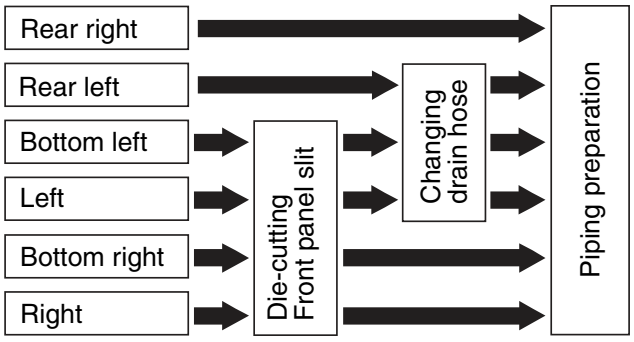


Fig. 10-3-10

Relocating drain hose

For left connection, left-bottom connection and rear-left connection's piping, it is necessary to relocate the drain hose and drain cap.

1. Cutting front panel slit.

   Cut out the slit on the left or right side of the front panel for the left or right connection and the slit on the bottom left or right side of the front panel for the bottom left or right connection with a pair of nippers.

2. Remove the drain cap

   Clamp drain cap with needle-nose pliers, and pull out.

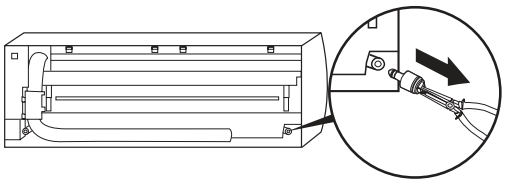


Fig. 10-3-11

3. Remove the drain horse

   The drain hose is secured in place by a screw.

   Remove the screw securing the drain hose, then pull out the drain hose.

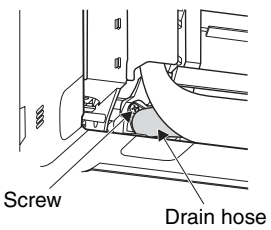


Fig. 10-3-12

4. Attach the drain cap
   - Insert hexagonal wrench (4 mm).

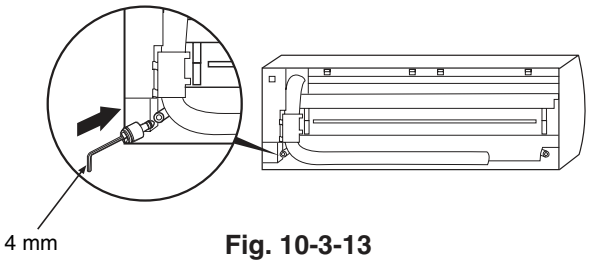


Fig. 10-3-13

5. Firmly insert drain cap.

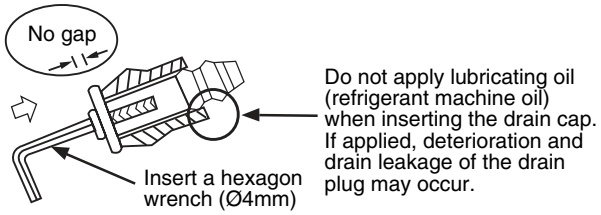

No gap
Do not apply lubricating oil (refrigerant machine oil) when inserting the drain cap. If applied, deterioration and drain leakage of the drain plug may occur.
Insert a hexagon wrench (Ø4mm)

Fig. 10-3-14

6. Attach the drain hose

   Insert the drain hose firmly until the connector contacts with the insulation, then secure it in place using the original screw.

   Always use the original screw that secured the drain hose to the unit.

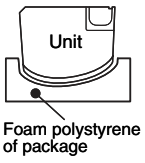
   If using a different screw may cause water to leak.

CAUTION

Securely insert the drain hose and drain cap; otherwise, water may leak.

NOTE:

The packaged foam polystyrene can be used to make replacement of the drain cap and drain hose easier.



Piping on the right side or the left side

- After making slits on the front panel with a knife or similar tool, cut them out with a pair of nippers or an equivalent tool.

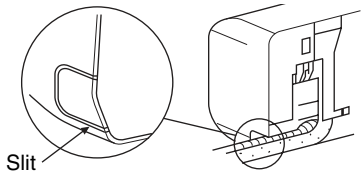


Fig. 10-3-15

Piping on the bottom right or the bottom left

- After making slits on the front panel with a knife or similar tool, cut them out with a pair of nippers or an equivalent tool.

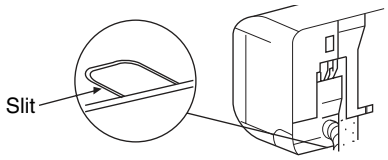


Fig. 10-3-16

Left-hand connection with piping

Bend the connecting pipes so that they are positioned within 43 mm above the wall surface.

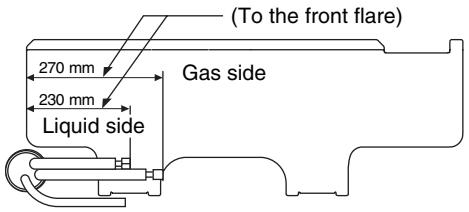
If the connecting pipes are positioned more than 43 mm above the wall surface, the indoor unit may be unstable.

When bending the connecting pipe, make sure to use a spring bender to avoid crushing the pipe.

Refer to the table below for the bending radius of each connection pipe.

Outer diameter	Bending radius
6.35 mm	30 mm
9.52 mm	40 mm
12.7 mm	50 mm

Connect the pipe after installation of the unit (figure)



R30 or less (Dia. 6.35), R40 or less (Dia. 9.52), R50 or less (Dia. 12.7)
Make sure to use a spring bender to avoid crushing the pipe.

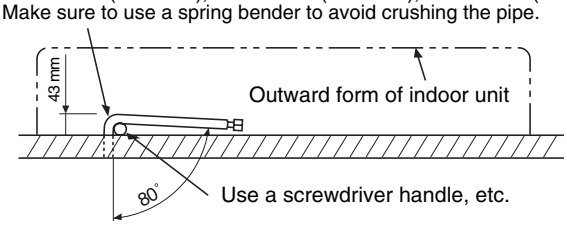


Fig. 10-3-17

NOTE:
If the pipe is incorrectly bent, the indoor unit may be unstable on the wall.

After passing the connecting pipe through the pipe hole, connect the connecting pipe to the auxiliary pipes and wrap the facing tape around them.

CAUTION

- Bind the auxiliary pipes (two) and connecting cable with facing tape tightly.

  In case of leftward piping and rear-leftward piping, bind the auxiliary pipes (two) only with facing tape.

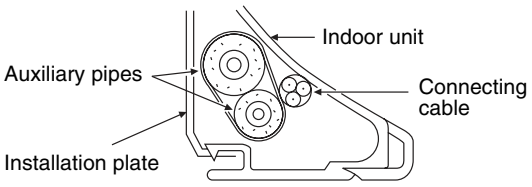


Fig. 10-3-18

- Carefully arrange the pipes so that none of the pipes stick out of the rear plate of the indoor unit.
- Carefully connect the auxiliary pipes and connecting pipes to each other and cut off the insulating tape wound on the connecting pipe to avoid double-taping at the joint, moreover, seal the joint with the vinyl tape, etc.
- Since condensation can result in machine performance trouble, be sure to insulate both connecting pipes. (Use polyethylene foam as insulating material.)
- When bending a pipe, be careful not to crush it.

10-3-6. Indoor Unit Installation

1. Pass the pipe through the hole in the wall, and hook the indoor unit on the installation plate at the upper hooks.
2. Swing the indoor unit to right and left to confirm that it is firmly hooked on the installation plate.
3. While pushing the indoor unit onto the wall, hook it at the lower part on the installation plate.

   Pull the indoor unit toward you to confirm that it is firmly hooked on the installation plate.
4. Pull the connecting cable through the cable slot on the rear panel so that it protrudes about 15 cm out of the front.

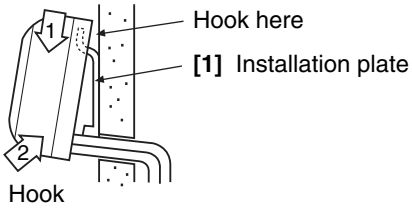


Fig. 10-3-19

- For detaching the indoor unit from the installation plate pull the indoor unit toward you while pushing the bottom up at the specified places.

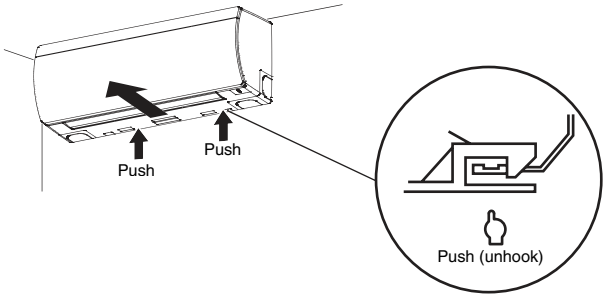


Fig. 10-3-20

10-3-7. Drainage

1. Run the drain hose at a downward sloped angle.

NOTE:

Hole should be made at a slight downward slant on the outdoor side.

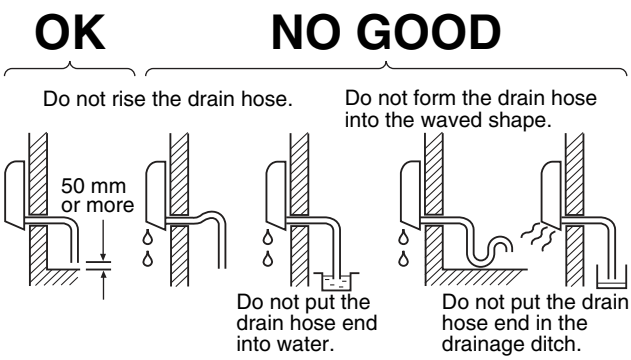

OK
NO GOOD
Do not rise the drain hose.
Do not form the drain hose into the waved shape.
50 mm or more
Do not put the drain hose end into water.
Do not put the drain hose end in the drainage ditch.

Fig. 10-3-21

2. Put water in the drain pan and make sure that the water is being drained outside.
3. When connecting extension drain hose, insulate the connection part of extension drain hose with shield pipe.

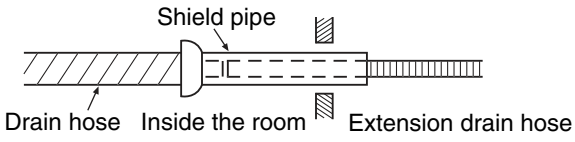


Fig. 10-3-22

CAUTION

Install the drain pipe for proper drainage.

Improper drainage can result in water dripping inside the room.

This air conditioner has been designed to drain water collected from condensation which forms on the back of the indoor unit, to the drain pan.

Therefore, do not locate the power cord and other parts at a high place above the drain guide.

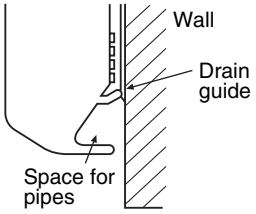


Fig. 10-3-23

10-4. Which Models Can Be Combined

Table of models that can be used in combination

Type	Outdoor unit	Combinations of indoor unit models that can be connected
Heat pump	RAS-M18UAV-E	07 + 07, 07 + 10, 07 + 13, 07 +16, 10 + 10, 10 + 13, 10 + 16, 13 + 13, 13+ 16

NOTE:

A 1-room connection is not an option for the indoor units (you cannot connect only one indoor unit).

A 2-room connection must always be used for the indoor units (you must connect two indoor units).

With the RAS-M18UAV-E outdoor unit model, the 16 + 16 combination is not an option.

10-5. Installation of Outdoor Unit

10-5-1. Installation Location

- A place which can bear the weight of the outdoor unit and does not allow an increase in noise level and vibration.
- A place where the operation noise and discharged air do not disturb neighbors.
- A place which is not exposed to a strong wind.
- A place free of combustible gases.
- A place which does not block a passageway.
- When the outdoor unit is to be installed in an elevated position, be sure to secure its feet.
- If the outdoor unit is to be mounted on a wall, make sure the platform supporting it is sturdy enough.
- The base plate should be designed and manufactured to maintain its strength over a long period of time, and sufficient consideration should be given to ensuring that the outdoor unit will not fall.
- When the outdoor unit is to be mounted high on a wall, take particular care to ensure that parts do not fall, and that the installer is protected.
- When doing installation work at ground level, it is usual to make wiring and pipe connections to the indoor units, first, and then to make connections to the outdoor units.

  However, if outdoor work is difficult it is possible, instead, to make changes to the procedure.
  For example, by making adjustments to the wiring and piping lengths on the inside (rather than the outside).
- A place where the drain water does not cause any problems.
- Install the outdoor unit in a location where there are no obstructions near its air intake or air outlet.
- When the outdoor unit is installed in a place that is always exposed to strong winds like on the coast or on a high story of a building, secure the normal fan operation using a duct or a wind shield.
- Especially in windy areas, install the unit to prevent the admission of wind.
- Installation in the following places may result in trouble. Do not install the unit in such places.
  - A place full of machine oil.
  - A saline-place such as the coast.
  - A place full of sulfide gas.
  - A place where high-frequency waves are likely to be generated, such as from audio equipment, welders, and medical equipment.

Necessary space for installation

NOTE:

For installation, at least 3 sides should be kept away from obstacles (walls).

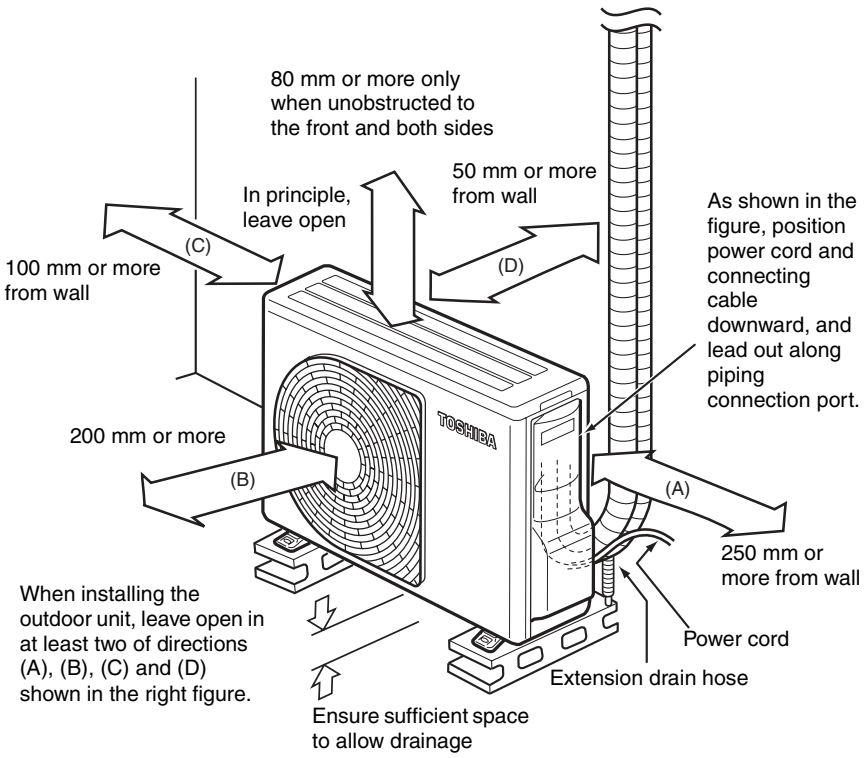


Fig. 10-5-1

Draining off the water from the outdoor unit

- If it is necessary to drain off the water from the outdoor unit, install two water-proofing rubber caps and a drain nipple.

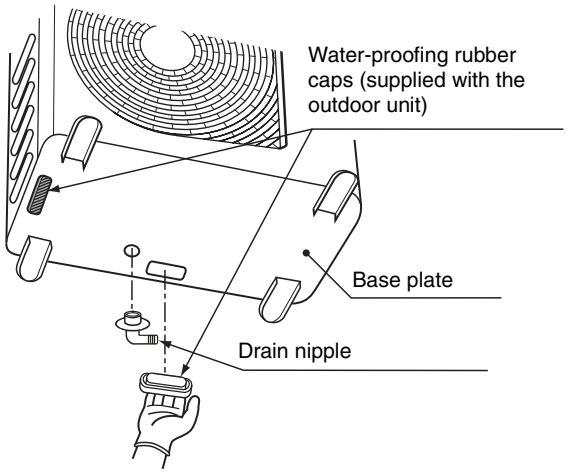


Fig. 10-5-2

Precautions about installation in regions with snowfall and cold temperatures

- Do not use the water-proofing rubber cap and drain nipple.
- If there is a danger that the drain water might freeze, take steps to ensure that the water will drain off in the most efficient manner.
- To protect the outdoor unit from snow accumulation, install a holding frame, and attach a snow protection hood and plate.
- Install at least 500 mm above the snow accumulation line.

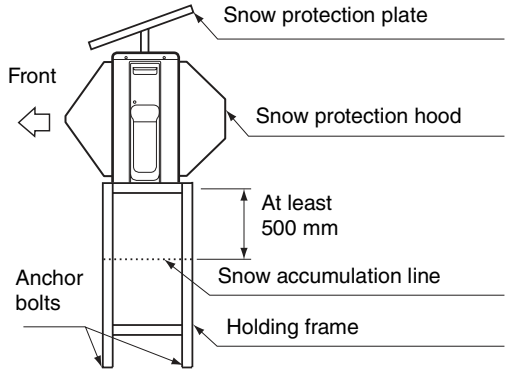


Fig. 10-5-3

Fixing the outdoor unit

- Secure the outdoor unit with the anchor bolts.
- Use 8 mm or 10 mm anchor bolts and nuts.
- Set the out margin of the anchor bolt to 15 mm or less.
- Install the outdoor unit so that it is level.
- Install the foundation and vibration-proof rubber pads to directly support the bottom surface of the fixing leg.

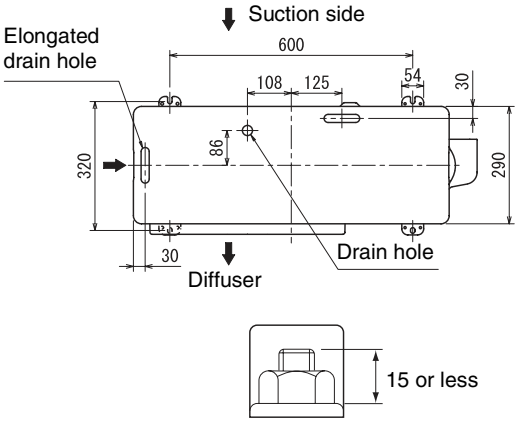


Fig. 10-5-4

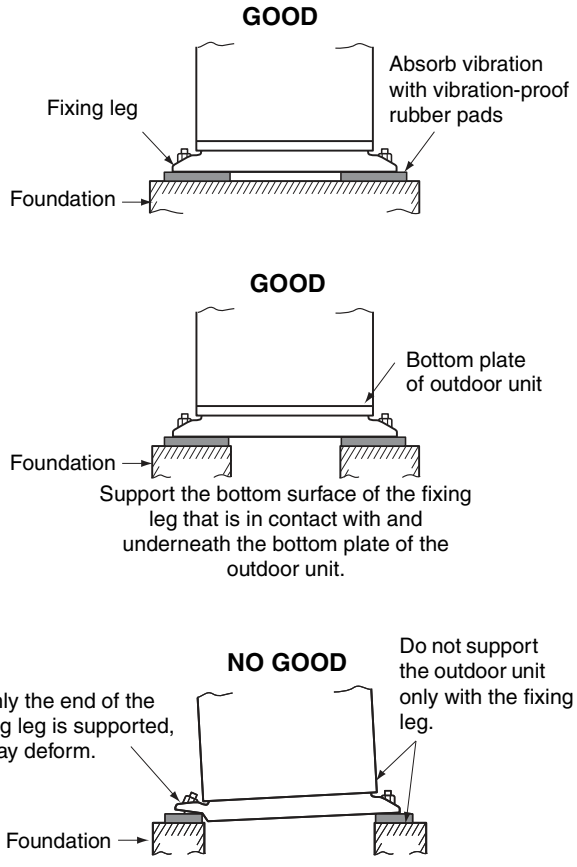

GOOD
Absorb vibration with vibration-proof rubber pads
Fixing leg
Foundation
GOOD
Bottom plate of outdoor unit
Foundation
Support the bottom surface of the fixing leg that is in contact with and underneath the bottom plate of the outdoor unit.
NO GOOD
Do not support the outdoor unit only with the fixing leg.
If only the end of the fixing leg is supported, it may deform.
Foundation

Fig. 10-5-5

10-5-2. Refrigerant piping

How to remove the service valve cover

- Remove the three screws.
  Pull the service valve cover in the direction of the arrow, and remove it.

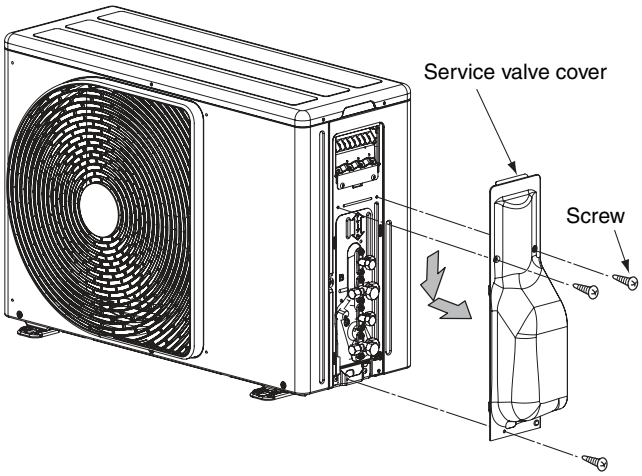


Fig. 10-5-6

Refrigerant piping connection

Flaring

1. Cut the pipe with a pipe cutter.
2. Deburr the inside of the pipe at its end.
   Take steps to ensure that the removed burrs will not enter the pipe.
3. Remove the flare nuts provided with the indoor and outdoor units, and insert them into the pipe.
4. Flare the pipe.
   The projection margin of the pipe must be checked.
5. Check that the flare has the appropriate shape.

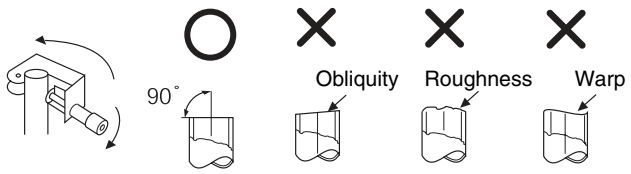


Fig. 10-5-7

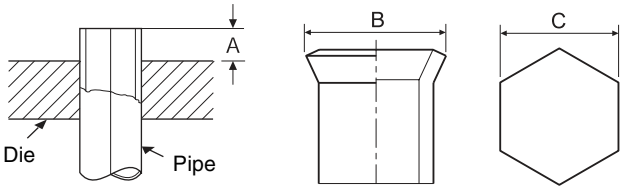


Fig. 10-5-8

Pipe		A		B	Flare Nut		
Outside diameter	Thickness	Rigid (clutch type) R410A tool	Imperial (wing nut type) R410A tool		C	Tighten torque	
mm	mm	mm	mm	mm	mm	N•m	kgf•m
6.35	0.8	0 to 0.5	1.5 to 2.0	9.1	17	14 to 18	1.4 to 1.8
9.52	0.8	0 to 0.5	1.5 to 2.0	13.2	22	33 to 42	3.3 to 4.2
12.7	0.8	0 to 0.5	2.0 to 2.5	16.6	26	50 to 62	5.0 to 6.2

Pipe connection

1. Ensure that the same wires and pipes are used for connecting all the indoor and outdoor units.
2. Align the centers of the connecting pipes and tighten the flare nut as much as possible with your fingers. Then tighten the nut with a wrench and torque wrench as shown in the table above.
   - If the indoor units have different capacities, connect them in the sequence of A and B starting with the unit which has the highest capacity.
   - Do not remove the flare nuts in any of the rooms where an indoor unit is not going to be connected.
   - Do not leave the pipes with their flare nuts removed standing for a prolonged period of time.
   - When connecting a capacity class 16 pipe to the indoor unit, attach the expander which is available as an optional accessory to the 9.52 mm diameter service valve of the outdoor unit.
   - When attaching the expander to the outdoor unit, be sure to fix the service valve with a wrench.

Air purge

Undertake the steps described below in each of the two rooms.
With respect to the preservation of the terrestrial environment, adopt “Vacuum pump” to purge air (Evacuate air in the connecting pipes) when installing the unit.

* Hexagon wrench (4 mm) is required.

1. Connect the charge hose. *1
   - Check that the handle Hi (manifold valve) is closed completely.
   - Attach the connecting port of the charge hose on the end with a projection to push the valve core (setting pin) to the service port of the set.

   *1 When a control valve or charge valve is connected between the charge hose and service port, the R410A refrigerant can definitely be prevented from being discharged to the atmosphere during the air purging process.
2. Open Handle Lo fully. Turn ON the vacuum pump.
   - Loosen the flare nut of the connected pipe (Gas side) a little to check that the air passes through. Retighten the flare nut.
   - If the air fails to enter, check whether the charge hose is connected securely to the service port.
   - Purge the air for 15 or more minutes, and check that a pressure level of –101 kPa (–76 cmHg) is indicated on the compound pressure gauge.
   - If the compound pressure gauge fails to indicate a pressure level of –101 kPa (–76 cmHg), it may mean that air is infiltrating from an area where a pipe is connected or other place. Check the areas where the pipes are connected.
3. Close Handle Lo completely. Turn OFF the vacuum pump.
   - Leave the vacuum pump as it is for 1 or 2 minutes, and check that the indicator of the compound pressure gauge does not return.
   - No more refrigerant needs to be added if the total pipe length is no more than 20 meters.
   - Add 20 g of refrigerant for every 1 m of piping that exceeds 21 m.
4. Disconnect the charge hose from the service port. Open the valve shaft fully with a hexagonal wrench.
5. Tighten the service port cap and valve stem cap securely.
   - Securely tighten these caps with torque in the following table.
6. Check the gas leaks after connection.

Service valve	Tighten torque			
	Valve stem cap		Service port cap	
	N•m	kgf•m	N•m	kgf•m
Liquid side (6.35)	14 to 18	1.4 to 1.8	—	—
Gas side (9.52)	33 to 42	3.3 to 4.2	14 to 18	1.4 to 1.8

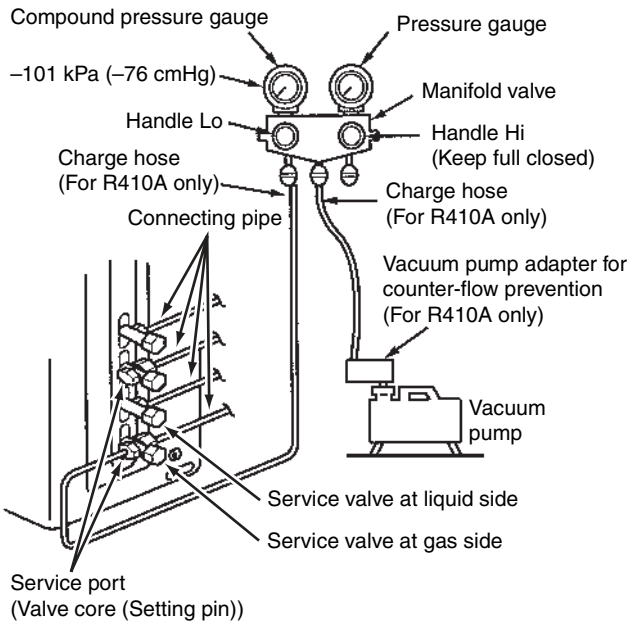


Fig. 10-5-9

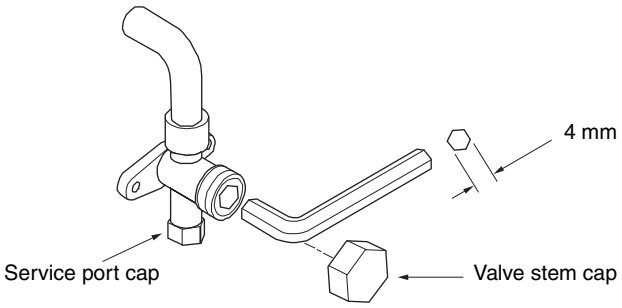


Fig. 10-5-10

CAUTION

Install in rooms that are 5 m³ or larger. If a leak of refrigerant gas occurs inside the room, an oxygen deficiency can occur.

Adding refrigerant

- No more refrigerant needs to be added if the total pipe length is no more than 20 meters.
- Add 20 g of refrigerant for every 1 m of piping that exceeds 21 m.

Procedure for charging the refrigerant

1. After the air inside the refrigerant pipe has been purged, close the valve and, while the units are not running, charge the refrigerant.
2. If the specified amount of refrigerant cannot be charged, add the remaining refrigerant from the charge port of the service valve at the gas side while at the same time performing a cooling operation.

Precautions to be heeded while the refrigerant is being charged

- Charge the refrigerant while it is still in liquid form.
- Charging the refrigerant in the form of a gas will change the composition of the refrigerant, making normal operation impossible.

Precautions for adding refrigerant

- Use a scale having a precision with at least 10 g per index line when adding the refrigerant. Do not use a bathroom scale or similar instrument.
- Use liquid refrigerant when refilling the refrigerant. Since the refrigerant is in liquid form, it can fill quickly. Therefore, perform the filling operation carefully and insert the refrigerant gradually.

Precautions for the refrigerant

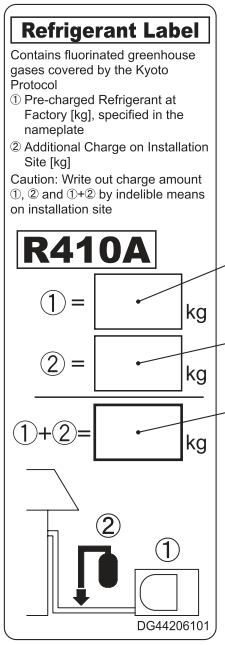
This product contains fluorinated greenhouse gases covered by the Kyoto Protocol.

Chemical name of gas: R410A

Global Warming Potential (GWP) of gas: 1975

1. Paste the enclose refrigerant label adjacent to the charging and/or recovering location.
2. Clearly write the charge refrigerant quantity on the refrigerant label using indelible ink.
3. Prevent emission of the contained fluorinated greenhouse gas.

   Ensure that the fluorinated greenhouse gas is never vented the atmosphere during installation, service or disposal.
   When any leakage of the contained fluorinated greenhouse gas is detected, the leak shall be stopped and repaired as soon as possible.
4. Only qualified service personnel are allowed to access and service is product.
5. Any handling of the fluorinated greenhouse gas in the product, such as when moving the product or recharging the gas, shall comply under (EC) Regulation No.842/2006 on certain fluorinated greenhouse gases and any relevant local legislation.
6. Contact dealers, installers, etc., for any questions.


Refrigerant Label
Contains fluorinated greenhouse gases covered by the Kyoto Protocol
① Pre-charged Refrigerant at Factory [kg], specified in the nameplate
② Additional Charge on Installation Site [kg]
Caution: Write out charge amount ①, ② and ①+② by indelible means on installation site
R410A
① = kg
② = kg
①+②= kg
②
①
DG44206101

Write here the amount of pre-charged refrigerant at factory (specified in the nameplate).

Write here the amount of additional charge on installation site.

Write here the amount of refrigerant which is equivalent to total of ① and ②.

Fig. 10-5-11

NOTE:

Periodical inspections for refrigerant leaks may be required depending on European or local legislation.

Gas leak check

- Check for gas leaks at all connections of the indoor unit and outdoor unit.
- For R410A, use the leak detector exclusively manufactured for R410A refrigerant.

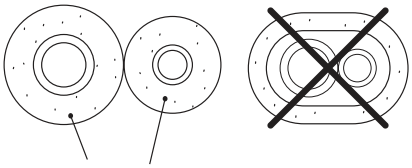
Flare nut connections (Indoor unit)

- Flare nut connections (Outdoor unit)
- Valve stem cap connection
- Service port cap connection

Fig. 10-5-12

Insulating the pipes

- Insulate the pipes separately for the liquid side and gas side.



Refrigerant piping covered with insulating material (polyethylene form, 6 mm thick). In case the duct-type or cassette-type unit is to be installed, it shall be covered with thicker insulating material (polyethylene form, 10 mm thick).

Fig. 10-5-13

When installing additional indoor units at a later date

1. Set the circuit breaker to the “off” position.
2. Follow the same procedure starting with the “REFRIGERANT PIPING” item on the previous page, and install the additional indoor unit or units.

Pump-down operation (recovering refrigerant)

Undertake the steps described below in each of the two rooms.

1. Open the service valve cover of the outdoor unit.
2. Connect the charge hose to the service port.
3. Turn on the unit.
4. Set the all connected indoor units to COOL mode and start the operation.
5. Wait until at least 10 minutes have elapsed since operation was started, and then close the valve of the service valve at the liquid side.
6. Confirm that the compound pressure gauge reading is –101 kPa (–76 cmHg).
7. Close the valve of the service valve at the gas side.
8. Turn off the unit.
9. Disconnect the connection pipes at both liquid and gas side.

CAUTION

In a pump-down operation, be sure to take the following steps.

- Ensure that no air is allowed to enter inside the refrigeration cycle.
- After having closed the two service valves, shut down the compressor, and then remove the refrigerant pipe.

If removing the refrigerant pipe while the compressor is operating with the service valve opened, it may cause air suction and overpressure inside the refrigeration cycle, resulting in burst of the unit or injury.

10-5-3. Electrical work

WARNING

- Be sure to comply with local regulations/codes when running the wire from outdoor unit to indoor unit.
  (Size of wire and wiring method etc.)
- Capacity shortages of the power circuit or an incomplete installation may cause an electric shock or fire.
- Ensure that all terminals are securely fixed using the specified cables, so preventing any external forces having a negative effect on the terminals.
- Improper connection or fixing may cause a fire.
- Be sure to connect earth wire (grounding work).
- Incomplete grounding cause an electric shock.

CAUTION

- Use a circuit breaker of a type that is not tripped by shock waves.
- Incorrect/incomplete wiring will cause electrical fires or smoke.
- Prepare the power source for exclusive use with the air conditioner.
- This product can be connected to the main power.
  Fixed wire connections:
  A switch that disconnects all poles and has a contact separation of at least 3mm must be incorporated in the fixed wiring.

Wiring connection

- The dashed lines show on-site wiring.

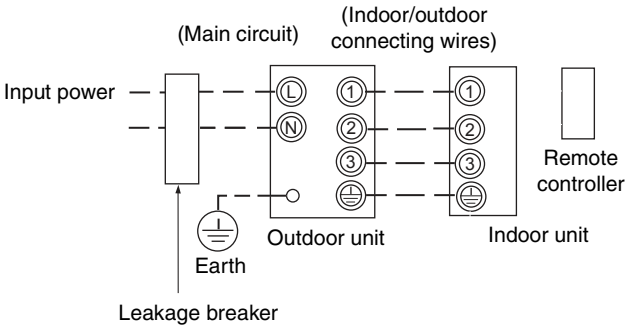


Fig. 10-5-14

- Connect the indoor/outdoor connecting wires to the identical terminal numbers on the terminal block of each unit.
- Incorrect connection may cause a failure.

1. Remove the service valve cover from the outdoor unit.
2. Remove the cord clamp.
3. Connect the power cord and the connecting cable to the terminal as identified by the matching numbers on the terminal block of indoor and outdoor unit.
4. Secure the power cord and the connecting cable with the cord clamp.
5. Attach the service valve cover on the outdoor unit.

Stripping length of connecting cable for outdoor unit

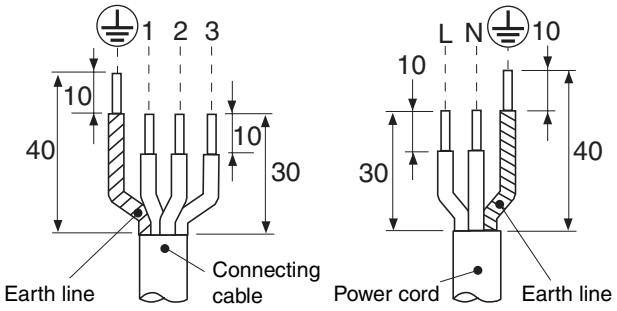


Fig. 10-5-15

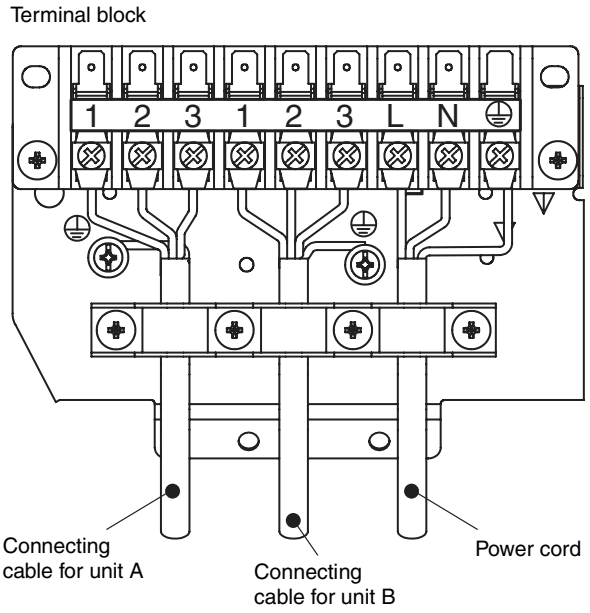


Fig. 10-5-16

10-5-4. Grounding

This air conditioner must be grounded without fail.

- Grounding is necessary not only to safeguard against the possibility of receiving an electric shock but also to absorb both the static, which is generated by high frequencies and held in the surface of the outdoor unit, and noise since the air conditioner incorporates a frequency conversion device (called an inverter) in the outdoor unit.
- If the air conditioner is not grounded, users may receive an electric shock if they touch the surface of the outdoor unit and that unit is charged with static.

10-5-5. Test operation

Miswiring (Mis-piping) check

1. Turn on the power breaker.
2. Set all the connected indoor units to COOL mode and check the operation.
   - It is unnecessary to set the temperature.
   - Miswiring checks cannot be executed when the outdoor air temperature is 5°C or less.
3. Start the check.
   - Perform a cooling operation only for the indoor unit which is installed in room A, and check that cool air is being blown out from the indoor unit in this room.
   - If cool air is not being blown out from the indoor unit in room A, touch the piping used to make the connections to room B where the indoor unit is shut down. If it is verified that the piping is cold to the touch and that refrigerant is circulating, it means that a mistake has been made in the connection of the piping and/or wiring to the indoor units.
     Turn off the power breaker, and check the situation again.

Gas leak check

- Check for gas leaks at all connections of the indoor unit and outdoor unit.
- For R410A, use the leak detector exclusively manufactured for R410A refrigerant.

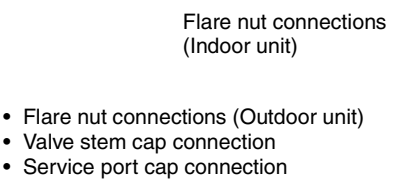

Flare nut connections
(Indoor unit)
• Flare nut connections (Outdoor unit)
• Valve stem cap connection
• Service port cap connection

Fig. 10-5-17

Test operation

1. When performing the test operation during the summer months, proceed with the cooling operation first, and after the room temperature has dropped, perform the heating operation.
   (Heating operation: Remote control temperature setting of 30°C)
   - When performing the test operation during the winter months, proceed with the heating operation first, and then perform the cooling operation.
     (Cooling operation: Remote control temperature setting of 17°C)
2. The test operation must be performed without fail one room at a time for all the rooms concerned, and the operations for cooling and heating must each be performed for at least 10 minutes.
   - The cooling and heating operations can be performed using the room temperature sensors of the indoor units.
     Cooling operation: Expose the room temperature sensor to a hair dryer or other heating device.
     Heating operation: Hold a chilled towel or other article up against the room temperature sensor.

What is to be explained to the customers

- While referring to the OWNER'S MANUAL which is provided with the indoor unit, have the customers actually use the controls on the unit for themselves, and show them how to operate the unit correctly.
- Do not select the cooling operation and heating operation at the same time.
  When these indoor units in two or more rooms are to be operated at the same time, the type of operation in the room where operation was first initiated takes precedence.
- When the air conditioner is started up or when its operation mode is switched, operation will not be initiated for about 3 minutes. This delay is designed to protect the main unit, and it is normal and not indicative of any malfunctioning.
- When the outdoor temperature drops, power is supplied to the compressor to preheat it as a way of protecting the compressor. Use the air conditioner with the circuit breaker left at the "on" setting. The power consumption level while the compressor is in the preheat status is approximately 20 W.
- This outdoor unit uses an electronic expansion valve. It will make a rattling sound when the power is turned on and when operation is started up at a rate of once every one to two months: This is normal and not indicative of any malfunctioning. This sound is made when the initial settings for ensuring that control will be exercised under the optimum conditions are being established.
- During heating operations, refrigerant will flow to the indoor units which are currently shut down as well: For this reason, sounds may be heard from the units which are shut down or the surfaces of the indoor units may warm up.

10-6. Test Operation

10-6-1. Gas Leak Test

Check the flare nut connections for gas leaks with a gas leak detector and/or soapy water.

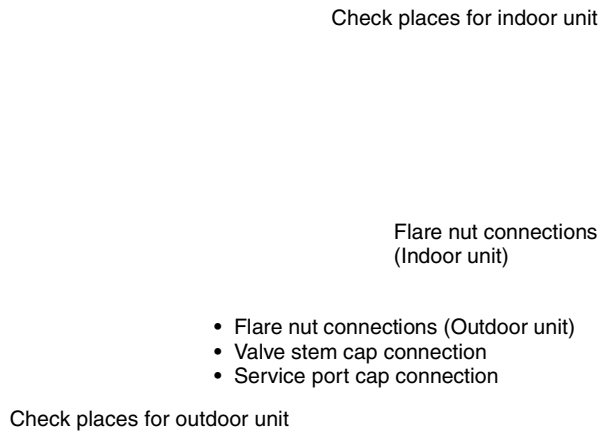

Check places for indoor unit
Flare nut connections
(Indoor unit)
• Flare nut connections (Outdoor unit)
• Valve stem cap connection
• Service port cap connection
Check places for outdoor unit

Fig. 10-6-1

10-6-2. Test Operation

To test the system, push and hold RESET button for 10 sec. (There will be one short beep.)

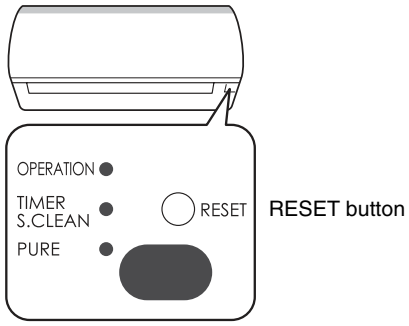


Fig. 10-6-2

10-6-3. Setting the Auto Restart

This product is designed so that, after a power failure, it can restart automatically in the same operating mode as before the power failure.

NOTE:

The product was shipped with Auto Restart function in the OFF position. Turn it ON as required.

1) Push and hold the RESET button for about 3 seconds. After 3 seconds, three short electric beeps will be heard to inform you that the Auto Restart has been selected.
2) To cancel the Auto Restart, follow the steps described in the section Auto Restart Function of the Owner's Manual.

10-6-4. Select Switch on Remote Controller

- If two indoor units are installed in the same room or adjoining rooms, when the user tries to operate only one unit, both units may receive the same remote controller signal and operate.

  This can be prevented by changing one of the indoor units and remote controllers to setting "B" (the default setting for both units is "A").
- If the indoor unit and remote controller settings are different, the remote controller signal is not accepted.

Setting the remote controller

1) Slide open the remote controller cover and remove the batteries.
2) Cut the jumper wire inside the battery compartment using nippers.

NOTE:

The jumper wire should not remain in contact after being cut.

Also, be careful not to let plastic scraps, jumper wire cuttings or other debris enter the inside of the remote controller.

3. Insert the batteries.

   "B" appears in the remote controller display.

Setting the unit

1) Push the RESET button to start automatic operation.
2) Push the ⏻ button of the remote controller that was set in step 1 to stop the air conditioner. (This operation will change the setting to "B".)
3) Check that the remote controller operates the indoor unit.

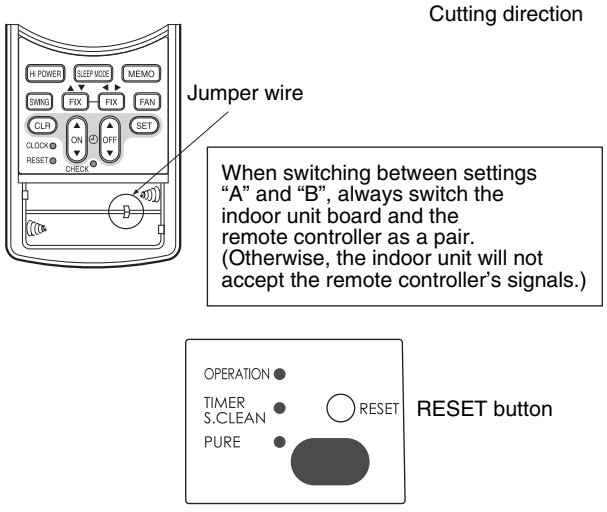


Fig. 10-6-3

10-7. Useful Functions

10-7-1. Self-Diagnosis by LED Indication

- For this outdoor unit, by referring to the 5 LED (Red) indicator lights, self-diagnosis is possible.
- LEDS (Red, D09 to D13) are located on the sub-control board underneath the inverter.

Contents	Indoor alarm code	LED indication				
		D09	D10	D11	D12	D13
Normal running	None	●	●	●	●	●
IGBT short circuit, Compressor motor rear short	14	●	¤	●	●	●
Trouble on position detecting circuit	16	¤	¤	●	●	●
Trouble on current detecting circuit	17	●	●	¤	●	●
Condensor pipe temp. sensor (TE) fault	18	¤	●	¤	¤	●
Suction pipe temp. sensor (TS) fault	18	●	●	¤	¤	●
Discharge pipe temp. sensor (TD) fault	19	●	¤	¤	●	●
Trouble on outdoor fan	1A	¤	¤	¤	●	●
Outdoor temp. sensor (TO) fault	1B	●	●	●	¤	●
Trouble on compressor system	1C	¤	●	¤	●	●
Gas side pipe temp. sensor a (TGa) fault	1C	¤	¤	¤	¤	●
Gas side pipe temp. sensor b (TGb) fault	1C	¤	●	●	●	¤
TGa, TGb sensor out of place, P.M.V. fault	1C	¤	¤	¤	●	¤
Communication trouble between M.C.U.	1C	¤	¤	●	¤	¤
Compressor lock	1D	¤	●	●	¤	●
Trouble on discharge temp. Gas leakage	1E	●	¤	●	¤	●
Compressor break down	1F	¤	¤	●	¤	●

¤: LED ON, ● : LED OFF

- **These LEDs do not normally light.**
  1. If trouble occurs, LED (Red) goes on according to the contents of trouble as shown in the table above.
  2. When two or more troubles occur, LEDs go on cyclically (alternately).
  3. When the trouble is eliminated, LEDs (Red) go off.

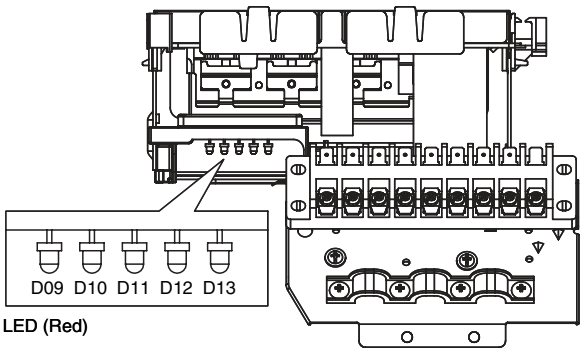


Fig. 10-7-1

This product is compliant with Directive 2002/96/EC, and cannot be disposed as unsorted municipal waste.

This product must be returned to the appropriate collection facility, as specified by your municipality.

11. HOW TO DIAGNOSE THE TROUBLE

The pulse motor circuits are mounted to both indoor and outdoor units.
Therefore, diagnose troubles according to the trouble diagnosis procedure as described below.
(Refer to the check points in servicing written on the wiring diagrams attached to the indoor/outdoor units.)

Table 11-1

No.	Troubleshooting Procedure	Page
1	First Confirmation	74
2	Primary Judgment	75
3	Judgment by Flashing LED of Indoor Unit	75
4	Self-Diagnosis by Remote Controller	76
5	Judgment of Trouble by Every Symptom	79
6	Check Code 1C and 1E	84

No.	Troubleshooting Procedure	Page
7	Trouble Diagnosis by Outdoor LED	85
8	Troubleshooting	86
9	How to Diagnose Trouble in Outdoor Unit	87
10	Inspection of the Main Parts	88
11	How to Simply Judge Whether Outdoor Fan Motor is Good or Bad	93

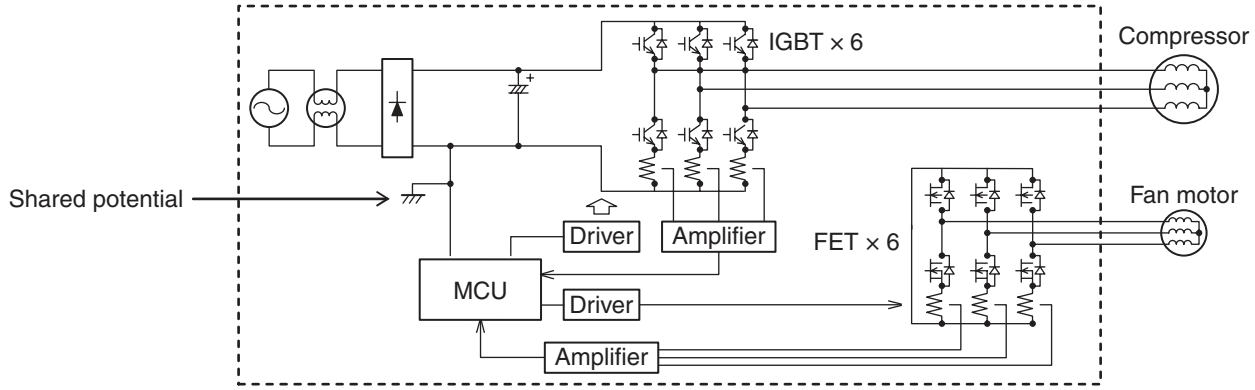
Precautions when handling the inverter

⚠ CAUTION: HIGH VOLTAGE

The high voltage circuit is incorporated.

Be careful to do the check service, as the electric shock may be caused in case of touching parts on the P.C. board by hand.

The control circuitry has an uninsulated construction.



M18UAV-E (uninsulated type)

Fig. 11-1

⚠ CAUTION

A high voltage (equivalent to the supply voltage) is also energized to ground through the sensors, PMV and other low-voltage circuits.

The sensor leads and other wires are covered with insulated tubes for protection.

Nevertheless, care must be taken to ensure that these wires are not pinched.

Take sufficient care to avoid directly touching any of the circuit parts without first turning off the power.

At times such as when the circuit board is to be replaced, place the circuit board assembly in a vertical position.

Laying the board flat on an electrically conductive object (such as the top panel of the air conditioner's outdoor unit) while a charge is still retained by the electrolytic capacitors of the inverter's main circuit may cause short-circuiting between the electrolytic capacitors and secondary circuit components and result in damage to the components.

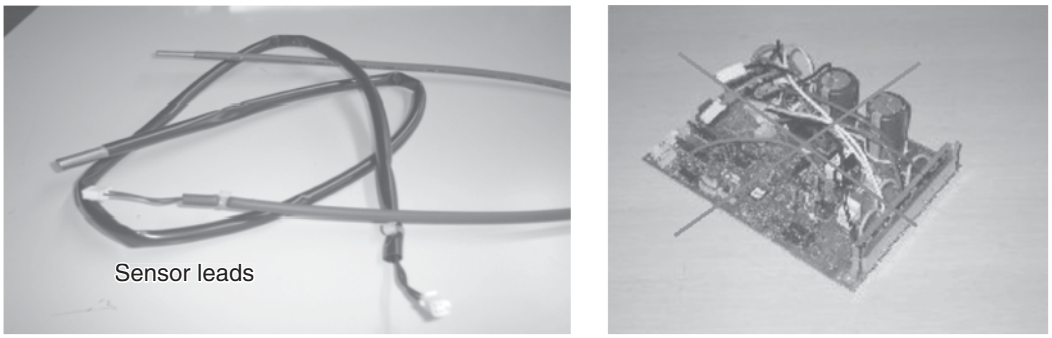


Fig. 11-2

Do NOT lay the circuit board assembly flat.

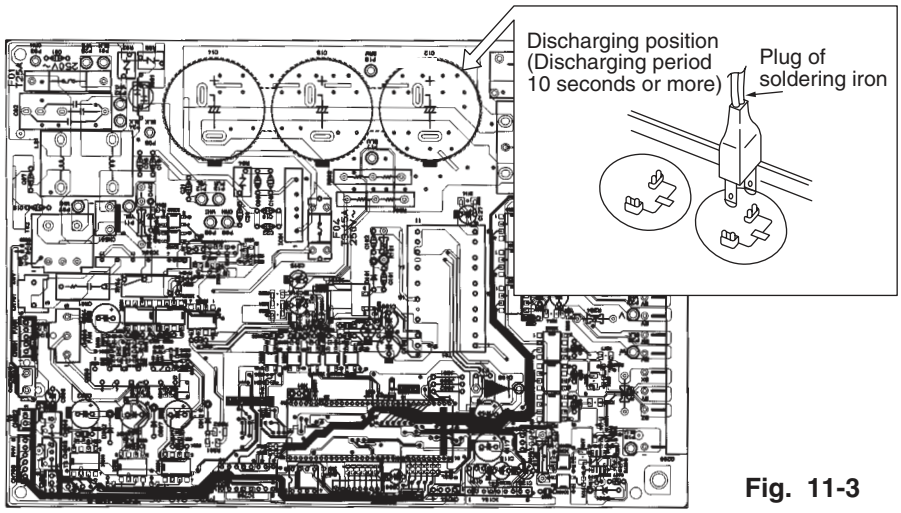
Precautions when inspecting the control section of the outdoor unit

NOTE:

A large-capacity electrolytic capacitor is used in the outdoor unit controller (inverter).
Therefore, if the power supply is turned off, charge (charging voltage DC280 to 380V) remains and discharging takes a lot of time.
After turning off the power source, if touching the charging section before discharging, an electrical shock may be caused. Discharge the electrolytic capacitor completely by using soldering iron, etc.

< Discharging method >

1. Remove the inverter cover (plating) by opening four mounting claws.
2. As shown below, connect the discharge resistance (approx. 100Ω40W) or plug of the soldering iron to voltage between + – terminals of the C14 ("CAUTION HIGH VOLTAGE" is indicated.) electrolytic capacitor (760μF/400V) on P.C. board, and then perform discharging.



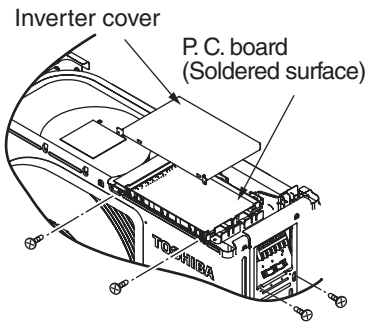


Fig. 11-3

11-1. First Confirmation

11-1-1. Confirmation of Power Supply

Confirm that the power breaker operates (ON) normally.

11-1-2. Confirmation of Power Voltage

Confirm that power voltage is AC 220–240 ±10%.

If power voltage is not in this range, the unit may not operate normally.

11-1-3. Operation Which is not a Trouble (Program Operation)

For controlling the air conditioner, the program operations are built in the microcomputer as described in the following table.

If a claim is made for running operation, check whether or not it meets to the contents in the following table.

When it does, we inform you that it is not trouble of equipment, but it is indispensable for controlling and maintaining of air conditioner.

Table 11-1-1

No.	Operation of air conditioner	Description
1	When power breaker is turned “ON”, the operation lamp (Green) of the indoor unit flashes.	The OPERATION lamp of the indoor unit flashes when power source is turned on. If “START/STOP” button is operated once, flashing stops. (Flashes also in power failure)
2	Compressor may not operate even if the room temperature is within range of compressor-ON.	The compressor does not operate while compressor restart delay timer (3-minutes timer) operates. The same phenomenon is found after power source has been turned on because 3-minutes timer operates.
3	In DRY and SLEEP MODE, FAN (air flow) display does not change even though FAN (air flow select) button is operated.	The air flow indication is fixed to [AUTO].
4	Increasing of compressor motor speed stops approx. 30 seconds after operation started, and then compressor motor speed increases again approx. 30 seconds after.	For smooth operation of the compressor, the compressor motor speed is restricted to Max. 41 rps for 2 minutes and Max. 91 rps for 2 minutes to 3 minutes, respectively after the operation has started.
5	The set value of the remote control should be below the room temperature.	If the set value is above the room temperature, Cooling operation is not performed. And check whether battery of the remote control is consumed or not.
6	In AUTO mode, the operation mode is changed.	After selecting Cool or Heat mode, select an operation mode again if the compressor keeps stop status for 15 minutes.
7	In HEAT mode, the compressor motor speed does not increase up to the maximum speed or decreases before the temperature arrives at the set temperature.	The compressor motor speed may decrease by high-temp. release control (Release protective operation by temp.-up of the indoor heat exchanger) or current release control.
8	Cool, Dry, or Heat operation cannot be performed.	When the unit in other room operates previously in different mode, Fan Only operation is performed because of first-push priority control. (Cool operation and Dry operation can be concurrently performed.)

11-2. Primary Judgment

To diagnose the troubles, use the following methods.

1) Judgment by flashing LED of indoor unit
2) Self-diagnosis by service check remote controller
3) Judgment of trouble by every symptom

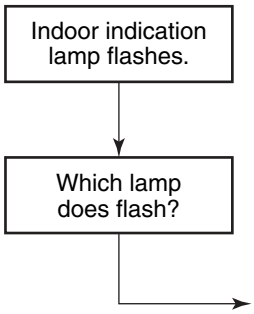
Firstly use the method (1) for diagnosis. Then, use the method (2) or (3) to diagnose the details of troubles.

For any trouble occurred at the outdoor unit side, detailed diagnosis is possible by 5 serial LED (Red) on the control P.C. board.

11-3. Judgment by Flashing LED of Indoor Unit

While the indoor unit monitors the operation status of the air conditioner, if the protective circuit operates, the contents of self-diagnosis are displayed with block on the indoor unit indication section.

Table 11-3-1

	Item	Check code	Block display	Description for self-diagnosis
	**A**	—	OPERATION (Green) Flashing display (1 Hz)	Power failure (when power is ON)
	B	00	OPERATION (Green) Flashing display (5 Hz)	Protective circuit operation for indoor P.C. board
	C	01	OPERATION (Green) TIMER (Orange) Flashing display (5 Hz)	Protective circuit operation for connecting cable and serial signal system
	D	02	OPERATION (Green) Flashing display (5 Hz)	Protective circuit operation for outdoor P.C. board
	E	03	OPERATION (Green) TIMER (Orange) Flashing display (5 Hz)	Protective circuit operation for others (including compressor)

NOTE:

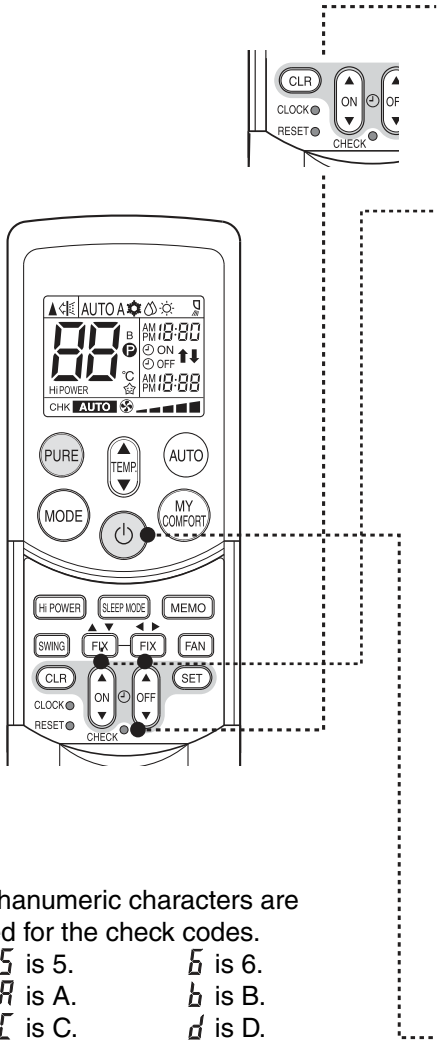
- The contents of items B and C and a part of item E are displayed when air conditioner operates.
- When item B and C, and item B and a part of item E occur concurrently, priority is given to the block of item B.
- The check codes can be confirmed on the remote controller for servicing.

11-4. Self-Diagnosis by Remote Controller (Check Code)

1. If the lamps are indicated as shown B to E in Table 11-3-1, execute the self-diagnosis by the remote controller.
2. When the remote controller is set to the service mode, the indoor controller diagnoses the operation condition and indicates the information of the self-diagnosis on the display of the remote controller with the check codes.

   If a fault is detected, all lamps on the indoor unit will flash at 5Hz and it will beep for 10 seconds (beep, beep, beep ...). The timer lamp usually flashes (5Hz) during self-diagnosis.

11-4-1. How to Use Remote Controller in Service Mode



Alphanumeric characters are used for the check codes.

5 is 5.	6 is 6.
A is A.	b is B.
C is C.	d is D.

1 **Push [CHECK] button with a tip of pencil to set the remote controller to the service mode.**

- " 00 " is indicated on the display of the remote controller.

2 **Push [ON ▲] or [OFF ▼] button**

If there is no fault with a code, the indoor unit will beep once (Beep) and the display of the remote controller will change as follows :

→ 00 → 01 → 02 ··· 1d → 1E → 33 →

- The TIMER indicator of the indoor unit flashes continuously. (5 times per 1 sec.)
- Check the unit with all 52 check codes (00 to 33) as shown in Table 11-4-1.
- Press [ON ▲] or [OFF ▼] button to change the check code backward.

If there is a fault, the indoor unit will beep for 10 seconds (Beep, Beep, Beep ...).

Note the check code on the display of the remote controller.

- 2-digits alphanumeric will be indicated on the display.
- All indicators on the indoor unit will flash. (5 times per 1 sec.)

3 **Press [START/STOP] button to release the service mode.**

- The display of the remote controller returns to as it was before service mode was engaged.

4 **Time shortening method.**

1. Press SET button while pushing CHECK button.
2. Press [START/STOP] button.

Fig. 11-4-1

11-4-2. Check Code

1. After servicing, press the START/STOP button to return to the normal mode.
2. After servicing by the check code, turn off breaker of the power supply, and turn on breaker of the power supply again so that memory in the microcomputer returns the initial status.

   However, the check codes are not deleted even if the power supply is turned off because they are stored in the fixed memory.
3. After servicing, press [CLR] button under check mode status and then send the check code “7F” to the indoor unit. The error code stored in memory is cleared.

Table 11-4-1

Block distinction		Operation of diagnosis function				Judgment and action
Check code	Block	Check code	Cause of operation	Air conditioner status	Remarks	
00	Indoor P.C. board etc.	0C	Short-circuit or disconnection of the room temperature sensor (TA sensor).	Operation continues.	Displayed when error is detected.	1. Check the room temp. sensor. 2. When the room temp. sensor is normal, check P.C. board.
		0d	Being out of place, disconnection, short-circuit, or migration of heat exchanger sensor (TC sensor)	Operation continues.	Displayed when error is detected.	1. Check heat exchanger sensor. 2. When heat exchanger sensor is normal, check P.C. board.
		0F	Being out of place, disconnection, short-circuit, or migration of heat exchanger sensor (TCj sensor)	Operation continues.	Displayed when error is detected.	1. Check heat exchanger sensor. 2. When heat exchanger sensor is normal, check P.C. board.
		11	Lock of indoor fan or trouble on the indoor fan circuit	All off	Displayed when error is detected.	1. Check the motor. 2. When the motor is normal, check P.C. board.
	Not displayed	12	Trouble on other indoor P.C. boards	Operation continues.	Displayed when error is detected.	Replace P.C. board.
01	Connecting cable and serial signal	04	Return serial signal is not sent to indoor side from operation started. 1) Defective wiring of connecting cable 2) Operation of compressor thermo Gas shortage Gas leak	Operation continues.	Flashes when trouble is detected on Return serial signal, and normal status when signal is reset.	1. When the outdoor unit never operate: 1) Check connecting cable, and correct if defective wiring. 2) Check 25A fuse of inverter P.C. board. 3) Check 3.15A fuse of connecting cable of inverter unit and outdoor unit. 2. To display [Other] block during operation, check compressor thermo. operation and supply gas (check gas leak also). 3. Unit operates normally during check. If return serial signal does not stop between indoor terminal board 2 and 3, replace inverter P.C. board. If signal stops between indoor terminal board 2 and 3, replace indoor P.C. board.

Block distinction		Operation of diagnosis function				Judgment and action
Check code	Block	Check code	Cause of operation	Air conditioner status	Remarks	
02	Outdoor P.C. board	14	Inverter over-current protective circuit operates. (Short time)	All off	Displayed when error is detected.	Even if trying operation again, all operations stop immediately. : Replace P.C. board.
		16	Position-detect circuit error or short-circuit between windings of compressor	All off	Displayed when error is detected.	1. Even if connecting lead wire of compressor is removed, position-detect circuit error occurred. : Replace P.C. board. 2. Measure resistance between wires of compressor, and perform short-circuit. : Replace compressor.
		17	Current-detect circuit error	All off	Displayed when error is detected.	Even if trying operation again, all operations stop immediately. : Replace P.C. board.
		18	Being out of place, disconnection or short-circuit of the outdoor heat exchanger sensor (TE) or suction temp. sensor (TS)	All off	Displayed when error is detected.	1. Check sensors (TE, TS). 2. Check P.C. board.
		19	Disconnection or short-circuit of discharge temp. sensor	All off	Displayed when error is detected.	1. Check discharge temp. sensor (TD). 2. Check P.C. board.
		1A	Outdoor fan drive system error	All off	Displayed when error is detected.	Position-detect error, over-current protective operation of outdoor fan drive system, fan lock, etc. : Replace P.C. board or fan motor.
	Not displayed	1b	Being out of place, disconnection or short-circuit of the outdoor temp. sensor (TO)	Operation continues.	—	1. Check outdoor temp. sensor (TO). 2. Check P.C. board.
	Outdoor P.C. board	1C	Compressor drive output error, Compressor error (lock, missing, etc.). Break down • Disconnection or short-circuit of the gas side sensor (TG). • Communication error between MCUs on outdoor P.C. board.	All off	Displayed when error is detected.	Check 5-serial LED. When 20 seconds passed after start-up, position-detect circuit error occurred. : Replace compressor. Trouble on P.M.V. • Check gas side temp. sensor (TG). • Check P.C. board. • Check communication wire between outdoor P.C. board. • Check outdoor P.C. board.
03	Others (including compressor)	07	Return serial signal has been sent when operation started, but it is not sent from halfway. 1) Compressor thermo. operation Gas shortage Gas leak 2) Instantaneous power failure	Operation continues.	Flashes when trouble is detected on return serial signal, and normal status when signal is reset.	1. Repeat Start and Stop with interval of approx. 10 to 40 minutes. (Code is not displayed during operation.) Supply gas. (Check also gas leak). 2. Unit operates normally during check. If return serial signal does not stop between indoor terminal block 2 and 3, replace inverter P.C. board. If signal stops between indoor terminal block 2 and 3, replace indoor P.C. board.
		1d	Compressor does not rotate. (Current protective circuit does not operate when a specified time passed after compressor had been activated.)	All off	Displayed when error is detected.	1. Trouble on compressor 2. Trouble on wiring of compressor (Missed phase)
		1E	Discharge temp. exceeded 117°C	All off	Displayed when error is detected.	1. Check dischage temp. sensor (TD). 2. Gas leakage 3. Trouble on P.M.V.
		1F	Break down of compressor	All off	Displayed when error is detected.	1. Check power voltage. (220–230–240 V +10%) 2. Overload operation of refrigeration cycle Check installation condition (Short-circuit of outdoor diffuser).
		08	4-way valve inverse error (TC sensor value lowered during heating operation.)	Operation continues.	—	1. Check 4-way valve operation.
		20	P.M.V. error	All off	Displayed when error is detected.	1. Check LED (D09–D13) on inverter P.C. board. 2. Check connection of P.M.V. wiring. 3. Start operation. (Excluding error room) 4. If the same error is occurred.Replace P.M.V.

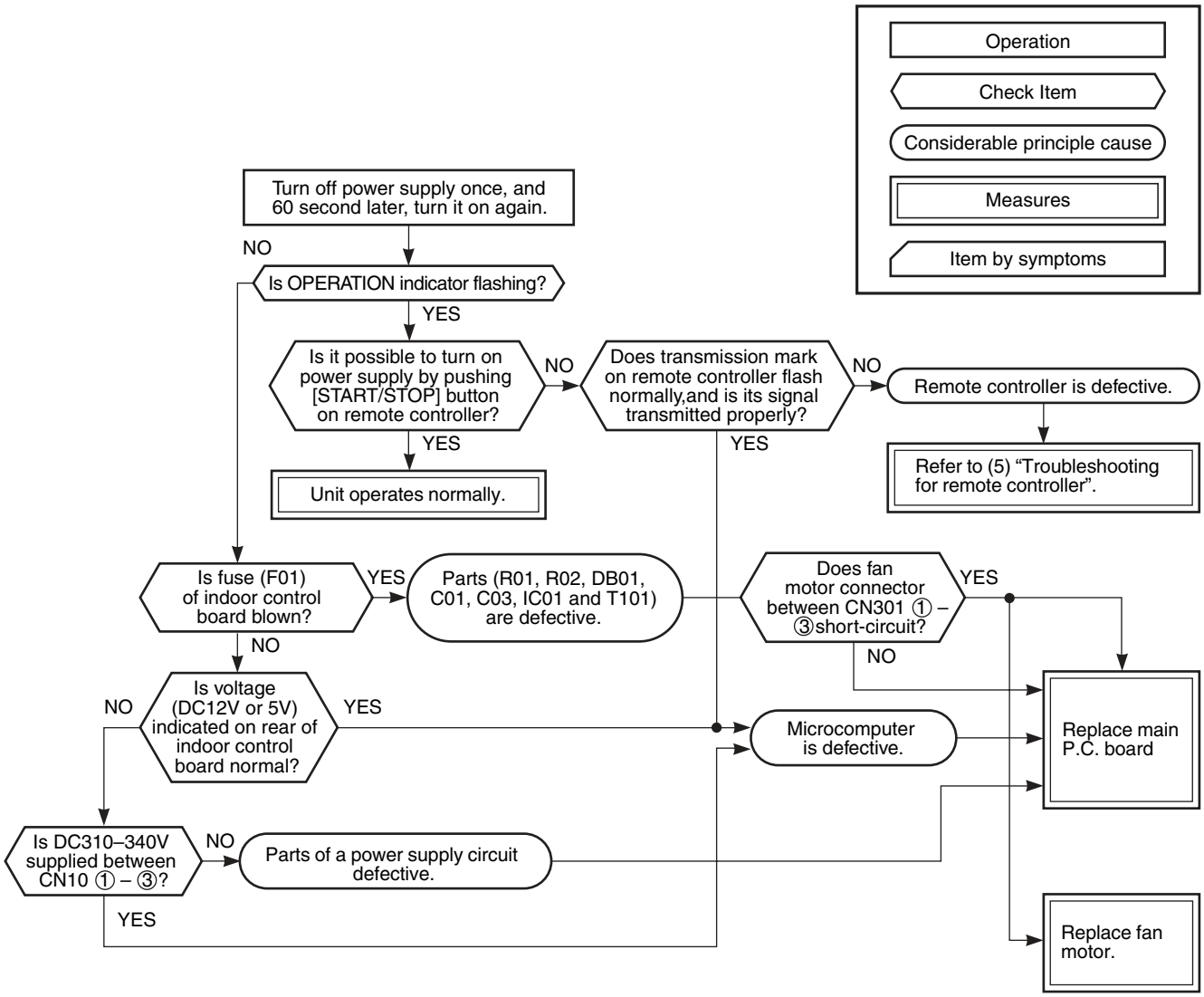
11-5. Judgment of Trouble by Symptom

11-5-1. Indoor Unit (Including Remote Controller)

(1) Power of indoor unit does not turned on

<Primary check>

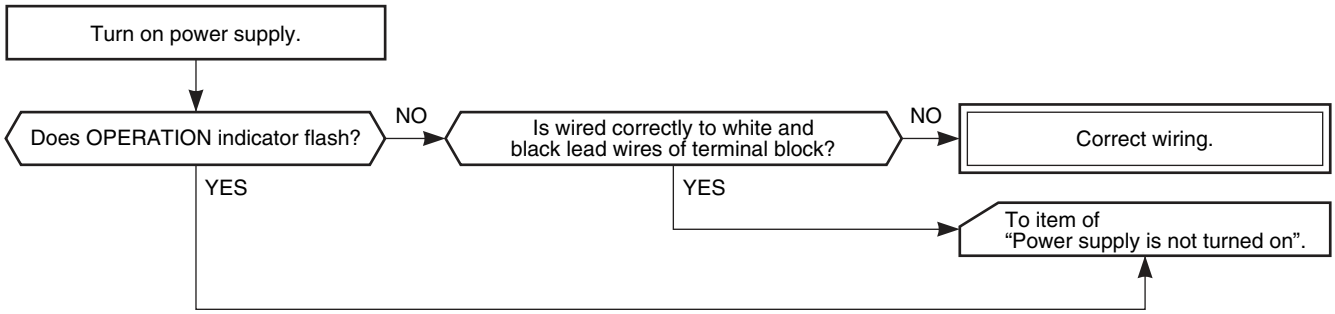
1. Is the supply voltage normal?
2. Is the normal voltage provided to the outdoor unit?
3. Is the crossover cable connected properly?
4. Is the fuse (F01) blown?


Operation
Check Item
Considerable principle cause
Measures
Item by symptoms
Turn off power supply once, and 60 second later, turn it on again.
NO
Is OPERATION indicator flashing?
YES
Is it possible to turn on power supply by pushing [START/STOP] button on remote controller?
NO
Does transmission mark on remote controller flash normally,and is its signal transmitted properly?
NO
Remote controller is defective.
YES
YES
Refer to (5) "Troubleshooting for remote controller".
Unit operates normally.
Is fuse (F01) of indoor control board blown?
YES
Parts (R01, R02, DB01, C01, C03, IC01 and T101) are defective.
Does fan motor connector between CN301 ① – ③short-circuit?
YES
NO
NO
Is voltage (DC12V or 5V) indicated on rear of indoor control board normal?
NO
YES
Microcomputer is defective.
Replace main P.C. board
Is DC310–340V supplied between CN10 ① – ③?
NO
Parts of a power supply circuit defective.
YES
Replace fan motor.

- Be sure to disconnect the motor connector CN301 after shut off the power supply, or it will be a cause of damage of the motor.

(2) Power of indoor unit does not turned on though Indoor P.C. board is replaced

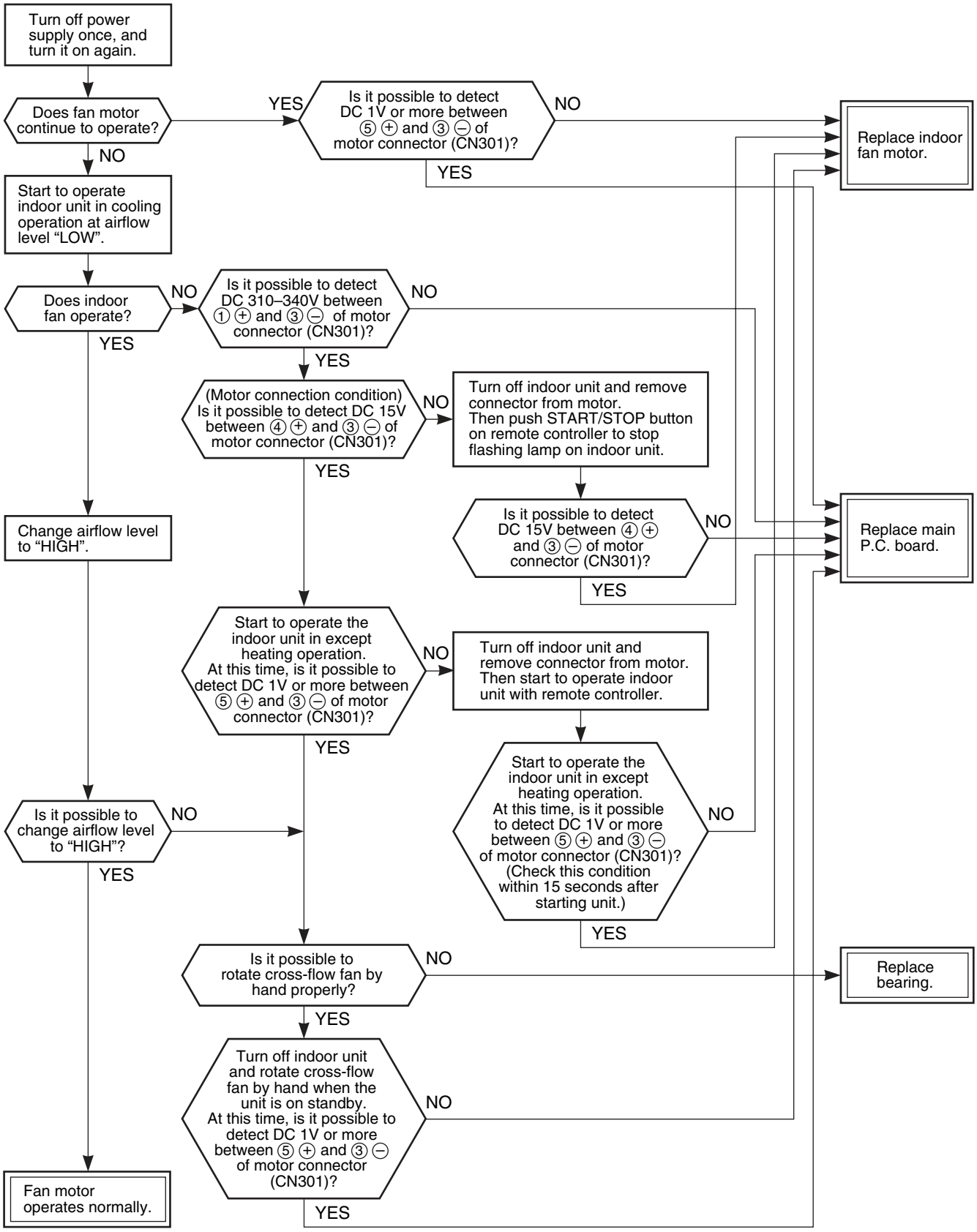
<Confirmation procedure>



(3) Only the indoor motor fan does not operate

<Primary check>

1. Is it possible to detect the power supply voltage (AC220–240V) between ① and ② on the terminal block?
2. .Does the indoor fan motor operate in cooling operation?
   (In heating operation, the indoor fan motor does not operate for approximately 10 minutes after it is turned on, to prevent a cold air from blowing in.)


Turn off power supply once, and turn it on again.
Does fan motor continue to operate?
YES
Is it possible to detect DC 1V or more between ⑤ ⊕ and ③ ⊖ of motor connector (CN301)?
NO
YES
Replace indoor fan motor.
NO
Start to operate indoor unit in cooling operation at airflow level "LOW".
Does indoor fan operate?
NO
Is it possible to detect DC 310–340V between ① ⊕ and ③ ⊖ of motor connector (CN301)?
NO
YES
YES
(Motor connection condition) Is it possible to detect DC 15V between ④ ⊕ and ③ ⊖ of motor connector (CN301)?
NO
Turn off indoor unit and remove connector from motor. Then push START/STOP button on remote controller to stop flashing lamp on indoor unit.
YES
Is it possible to detect DC 15V between ④ ⊕ and ③ ⊖ of motor connector (CN301)?
NO
YES
Replace main P.C. board.
Change airflow level to "HIGH".
Start to operate the indoor unit in except heating operation. At this time, is it possible to detect DC 1V or more between ⑤ ⊕ and ③ ⊖ of motor connector (CN301)?
NO
Turn off indoor unit and remove connector from motor. Then start to operate indoor unit with remote controller.
YES
Start to operate the indoor unit in except heating operation. At this time, is it possible to detect DC 1V or more between ⑤ ⊕ and ③ ⊖ of motor connector (CN301)? (Check this condition within 15 seconds after starting unit.)
NO
YES
Is it possible to change airflow level to "HIGH"?
NO
YES
Is it possible to rotate cross-flow fan by hand properly?
NO
YES
Replace bearing.
Turn off indoor unit and rotate cross-flow fan by hand when the unit is on standby. At this time, is it possible to detect DC 1V or more between ⑤ ⊕ and ③ ⊖ of motor connector (CN301)?
NO
YES
Fan motor operates normally.

(4) Indoor fan motor automatically starts to rotate by turning on power supply

<Cause>

The IC is built in the indoor fan motor. Therefore the P.C. board is also mounted to inside of the motor.

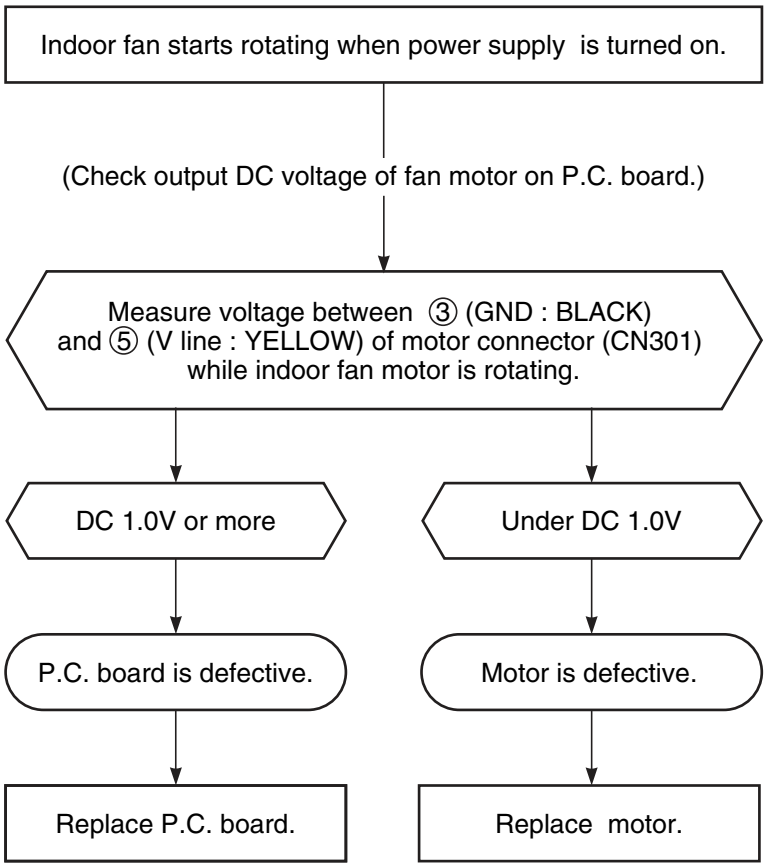
If the P.C. board is soldered imperfectly or the IC is defective, the fan motor may automatically rotate by turning on power supply.

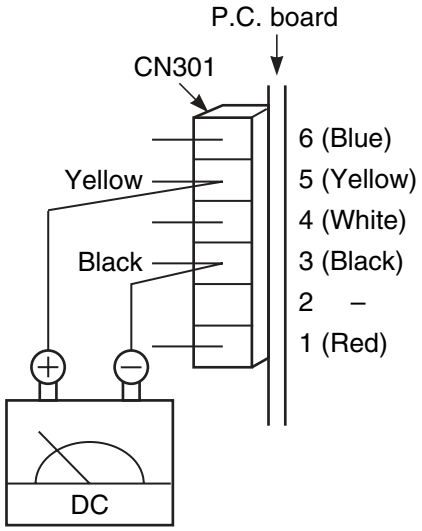
<Inspection procedure>

1. Remove the front panel. (Remove 2 screws.)
2. Remove the cover of the fan motor lead wires.
3. Check DC voltage with CN301 connector while the fan motor is rotating.

NOTE:

- Do not disconnect the connector while the fan motor is rotating.
- Use a thin test rod.

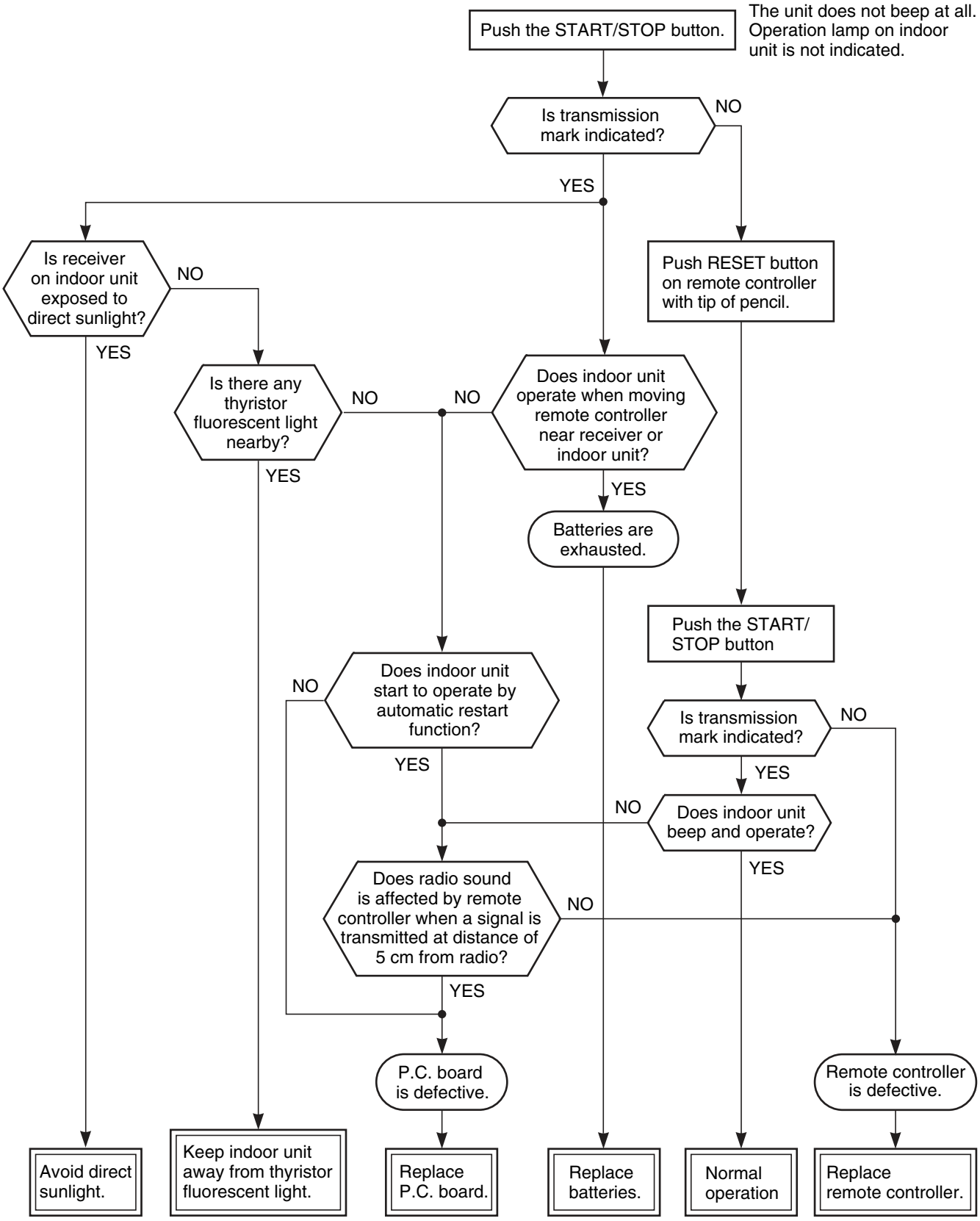

Indoor fan starts rotating when power supply is turned on.
(Check output DC voltage of fan motor on P.C. board.)
Measure voltage between ③ (GND : BLACK) and ⑤ (V line : YELLOW) of motor connector (CN301) while indoor fan motor is rotating.
DC 1.0V or more
Under DC 1.0V
P.C. board is defective.
Motor is defective.
Replace P.C. board.
Replace motor.



(5) Troubleshooting for remote controller

<Primary check>

Check that A or B selected on the main unit is matched with A or B selected on the remote controller.


Push the START/STOP button.
The unit does not beep at all. Operation lamp on indoor unit is not indicated.
Is transmission mark indicated?
NO
YES
Is receiver on indoor unit exposed to direct sunlight?
NO
YES
Push RESET button on remote controller with tip of pencil.
Is there any thyristor fluorescent light nearby?
NO
NO
Does indoor unit operate when moving remote controller near receiver or indoor unit?
YES
YES
Batteries are exhausted.
Push the START/ STOP button
NO
Does indoor unit start to operate by automatic restart function?
Is transmission mark indicated?
NO
YES
YES
NO
Does indoor unit beep and operate?
YES
Does radio sound is affected by remote controller when a signal is transmitted at distance of 5 cm from radio?
NO
YES
P.C. board is defective.
Remote controller is defective.
Avoid direct sunlight.
Keep indoor unit away from thyristor fluorescent light.
Replace P.C. board.
Replace batteries.
Normal operation
Replace remote controller.

NOTE : After replacing batteries, push the RESET button with a tip of a pencil.

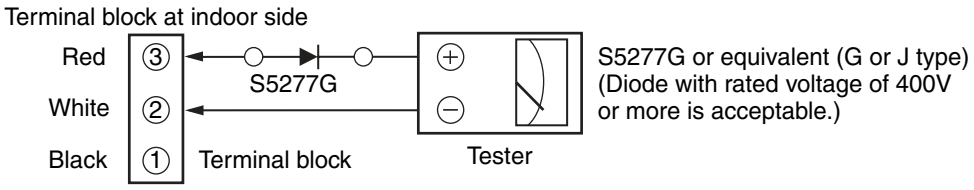
11-5-2. Wiring Failure (Interconnecting and Serial Signal Wire)

(1) Outdoor unit does not operate

1) Is the voltage between ② and ③ of the indoor terminal block varied?
2) Confirm that transmission from indoor unit to outdoor unit is correctly performed based upon the following diagram.

NOTE:

- Measurement should be performed 2 minutes and 30 seconds after starting of the operation.
- Be sure to prepare a diode for judgment.

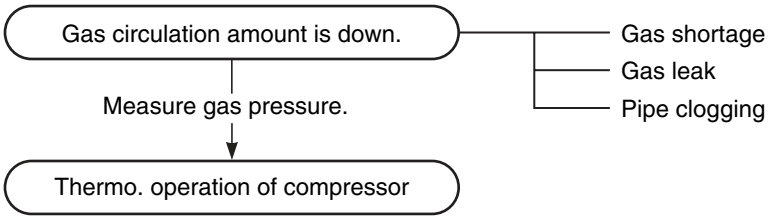


Normal time : Voltage swings between DC15 and 60V. ..... Inverter Assembly check
Abnormal time : Voltage does not vary.

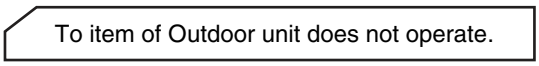
(2) Outdoor unit stops in a little while after operation started

<Check procedure> Select phenomena described below.

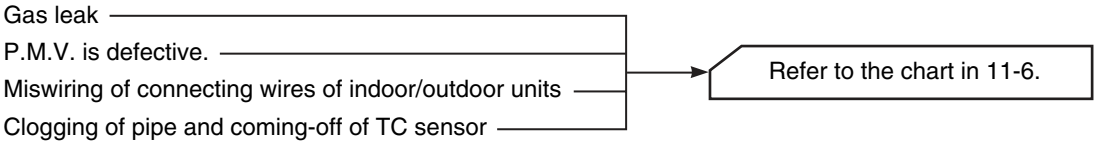
1) The outdoor unit stops 10 to 20 minutes after operation started, and 10 minutes or more are required to restart the unit.



2) If the unit stops once, it does not operate until the power will be turned on again.

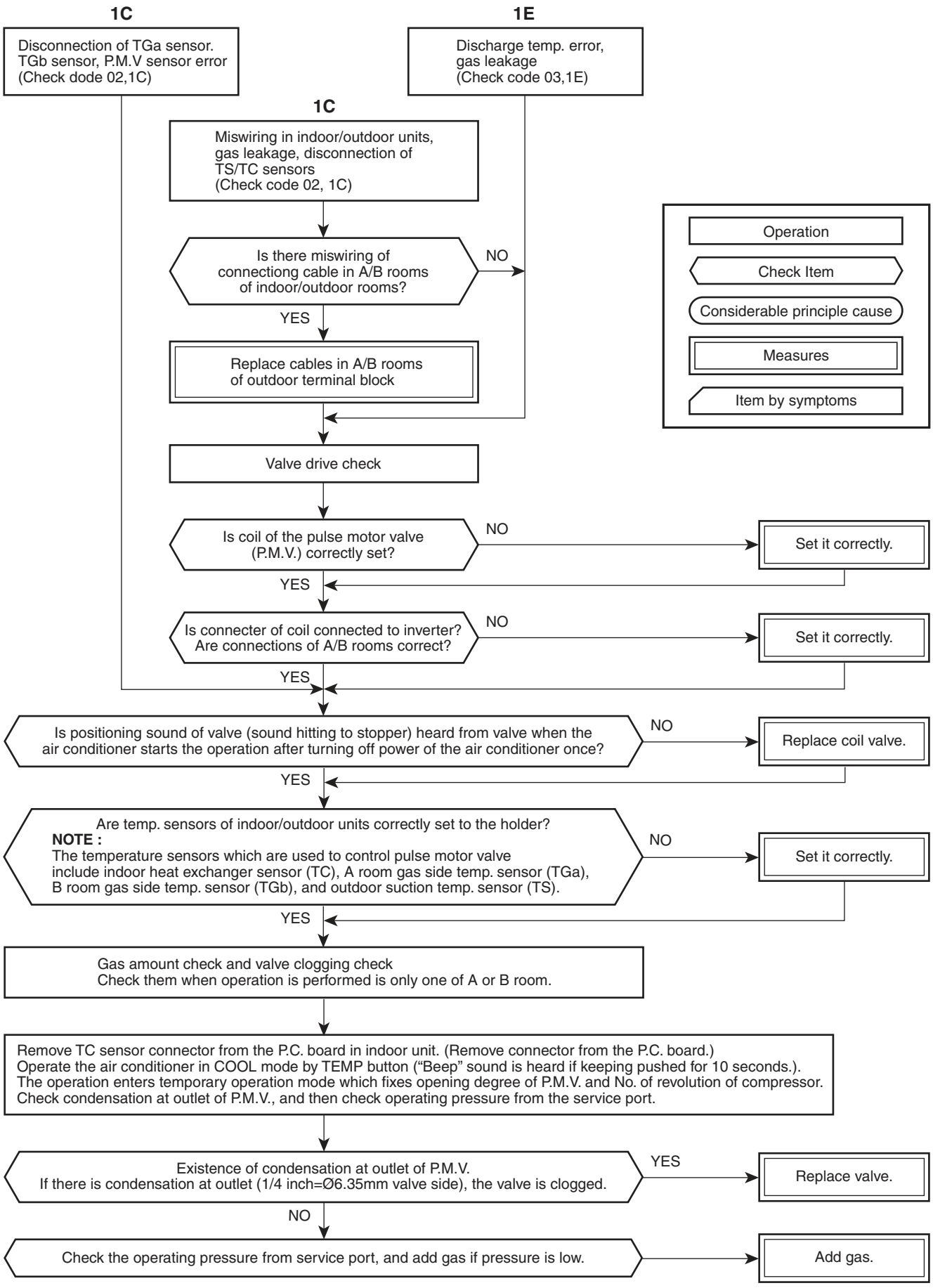


3) The outdoor unit stops 10 minutes to 1 hour after operation started, and an alarm is displayed. (Discharge temp. error check code 03, 1E Sensor temp. error check code 02, 1C)


Gas leak
P.M.V. is defective.
Miswiring of connecting wires of indoor/outdoor units
Clogging of pipe and coming-off of TC sensor
Refer to the chart in 11-6.

11-6. Check Code 1C (Miswiring in indoor/outdoor units) and 1E

<Check procedure>


1C
Disconnection of TGa sensor. TGb sensor, P.M.V sensor error (Check dode 02,1C)
1E
Discharge temp. error, gas leakage (Check code 03,1E)
1C
Miswiring in indoor/outdoor units, gas leakage, disconnection of TS/TC sensors (Check code 02, 1C)
Is there miswiring of connectiong cable in A/B rooms of indoor/outdoor rooms?
NO
YES
Replace cables in A/B rooms of outdoor terminal block
Valve drive check
Is coil of the pulse motor valve (P.M.V.) correctly set?
NO
Set it correctly.
YES
Is connecter of coil connected to inverter? Are connections of A/B rooms correct?
NO
Set it correctly.
YES
Is positioning sound of valve (sound hitting to stopper) heard from valve when the air conditioner starts the operation after turning off power of the air conditioner once?
NO
Replace coil valve.
YES
Are temp. sensors of indoor/outdoor units correctly set to the holder?
NOTE :
The temperature sensors which are used to control pulse motor valve include indoor heat exchanger sensor (TC), A room gas side temp. sensor (TGa), B room gas side temp. sensor (TGb), and outdoor suction temp. sensor (TS).
NO
Set it correctly.
YES
Gas amount check and valve clogging check
Check them when operation is performed is only one of A or B room.
Remove TC sensor connector from the P.C. board in indoor unit. (Remove connector from the P.C. board.)
Operate the air conditioner in COOL mode by TEMP button (“Beep” sound is heard if keeping pushed for 10 seconds.).
The operation enters temporary operation mode which fixes opening degree of P.M.V. and No. of revolution of compressor.
Check condensation at outlet of P.M.V., and then check operating pressure from the service port.
Existence of condensation at outlet of P.M.V.
If there is condensation at outlet (1/4 inch=Ø6.35mm valve side), the valve is clogged.
YES
Replace valve.
NO
Check the operating pressure from service port, and add gas if pressure is low.
Add gas.
Operation
Check Item
Considerable principle cause
Measures
Item by symptoms

11-7. Trouble Diagnosis by Outdoor LED

For the outdoor unit, the self-diagnosis is possible by five LEDs (Red).

- LEDs (Red) (D09 to D13) are provided on the sub-control board under surface of the inverter, and as shown below, they are checked from the wiring port when removing the wiring cover.

1. If a trouble occurs, LED (Red) goes on according to the trouble as described in the table below.
2. When two or more troubles occur, LEDs go on cyclically.
3. Usually, LEDs (Red) go off.

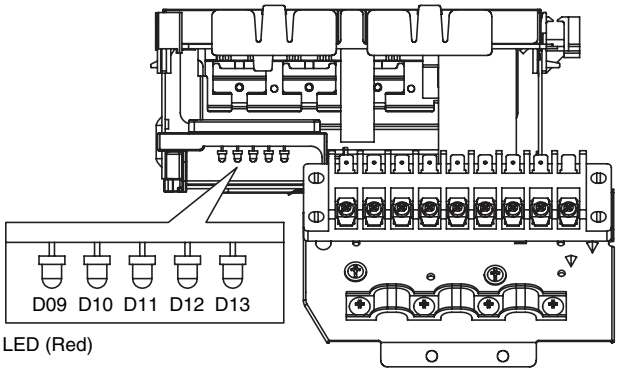


Fig. 11-7-1

Contents	Indoor alarm code	LED indication				
		D09	D10	D11	D12	D13
Normal running	None	●	●	●	●	●
IGBT short circuit, Compressor motor rear short	14	●	¤	●	●	●
Trouble on position detecting circuit	16	¤	¤	●	●	●
Trouble on current detecting circuit	17	●	●	¤	●	●
Condensor pipe temp. sensor (TE) fault	18	¤	●	¤	¤	●
Suction pipe temp. sensor (TS) fault	18	●	●	¤	¤	●
Discharge pipe temp. sensor (TD) fault	19	●	¤	¤	●	●
Trouble on outdoor fan	1A	¤	¤	¤	●	●
Outdoor temp. sensor (TO) fault	1B	●	●	●	¤	●
Trouble on compressor system	1C	¤	●	¤	●	●
Gas side pipe temp. sensor a (TGa) fault	1C	¤	¤	¤	¤	●
Gas side pipe temp. sensor b (TGb) fault	1C	¤	●	●	●	¤
TGa, TGb sensor out of place, P.M.V. fault	1C	¤	¤	¤	●	¤
Communication trouble between M.C.U.	1C	¤	¤	●	¤	¤
Compressor lock	1D	¤	●	●	¤	●
Trouble on discharge temp. Gas leakage	1E	●	¤	●	¤	●
Compressor break down	1F	¤	¤	●	¤	●

¤: LED ON, ● : LED OFF

11-8. Troubleshooting

11-8-1. How to Check Whether the Air Purifier is Good or Not

Primary check

Turn off the power breaker once, and turn on again after 10 seconds.

Does the OPERATION indicator flash?
- NO → To item “Power supply is not turned on”
- YES ↓

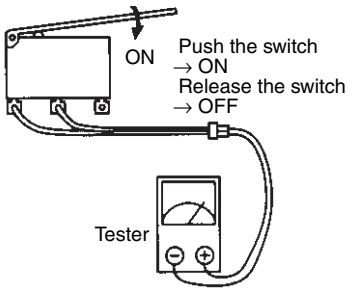
Turn off the power breaker and remove CN401 (Micro switch connector). Short-circuit between ① and ② pin of CN401 at PC side, and turn on the power breaker after 10 seconds.

Is DC12V applied between ① (Brown/DC12V) and (Red/GND) of CN402 of the high-voltage generator?
- NO → Is DC12V applied between ① (+) and ② (–) of CN402 of the main P.C. board (MCC5068)?
  - NO → To item “Power supply is not turned on”
  - YES → Replace the main P.C. board (MCC-1571)
- YES ↓

Is there conduction of micro-switch connector under OFF status of the micro-switch (Front panel opened)?
- YES → Micro-switch is stuck → Replace micro-switch.
- NO ↓

Is there conduction of micro-switch connector under ON status of the micro-switch (Front panel closed)?
- NO → Micro-switch malfunction → Replace micro-switch.
- YES ↓

• Conduction check of micro-switch



Operation check

1) Check operation while short-circuiting CN401 of the main P.C. board.
2) Perform air purifying operation by the remote controller.
   - In this time, check that the remote controller is in status which is shortened by time on the reactivation preventive timer and all display indicators go on for approx. 3 seconds when a signal is received.
     (If time on the reactivation preventive timer is not shortened, the high-voltage is not applied to electrode of the air purifier for approx. 1 hour.)
   - While the air purifier operates, check that the fan speed [AUTO] is not displayed. (Because the power ON/OFF is controlled on the program)
3) Be sure not to touch the electric dust collector, ionizer, or ionized wire unit with the human body.

Does the indoor fan rotate?
- NO → To item “Only indoor fan does not operate”
- YES ↓

Does the PURE indicator (Blue) or the FILTER indicator (Orange) go on?
- NO → Replace the main P.C. board (MCC-1571)
- YES ↓

Does the PURE indicator go off within 2 seconds after it was ON, and does the FILTER indicator (Orange) go on?
- NO → Referring to the right figure, check the high-output voltage of the air filter unit. **(NOTE)** Use an exclusive high voltage tester; otherwise the tester may be broken. [Be sure not to come to contact to the gray part or not to touch the ionized cables.]
- YES ↓

Are the electric dust collector and ionizer dried? (Electrode check)
- NO → Dry the electric dust collector and ionizer.
- YES ↓

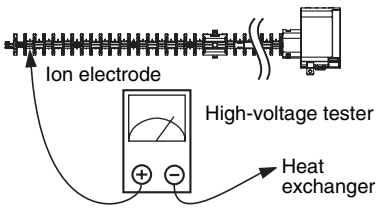
Refer to items, cleaning and check for the electric dust collector/ionizer/ ionized wire units. (When the ionized wire is disconnected or when dirt is not cleaned even cleaned, replace each unit.)

Referring to the right figure, check the high-output voltage of the air filter unit. **(NOTE)** Use an exclusive high voltage tester; otherwise the tester may be broken. [Be sure not to come to contact to the gray part or not to touch the ionized cables.]

Is output of the ionizer approx. 4.0 kV to 6.3 kV?
- NO → Replace the high-voltage generator.
- YES ↓

Are the electric dust collector/ionizer/ionized wire units dirty? Is an abnormal sound (cracking noise) heard from the electrode?
- YES → Refer to items, cleaning and check for the electric dust collector/ionizer/ ionized wire units. (When the ionized wire is disconnected or when dirt is not cleaned even cleaned, replace each unit.)
- NO → No trouble

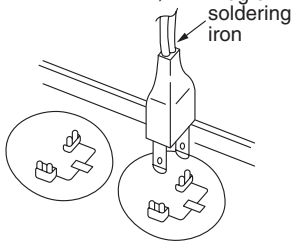
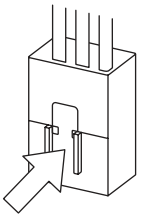
• How to check output of the air purifier
<Caution on High Voltage!!>

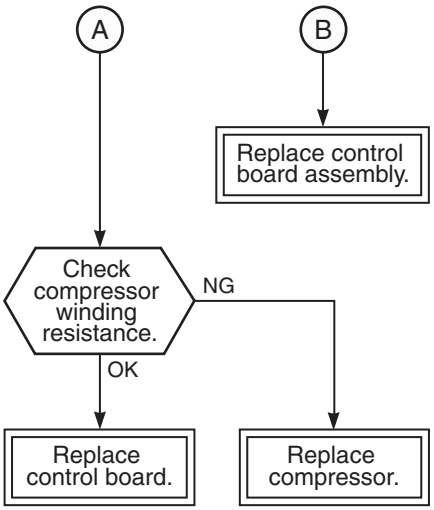


11-9. How to Diagnose Trouble in Outdoor Unit

11-9-1. Summarized Inner Diagnosis of Inverter Assembly

Table 11-9-1

Diagnosis/Process flowchart	Item	Contents	Summary
Remove connector of compressor.	Preparation	Turn "OFF" the power supply breaker, and remove 3P connector which connects inverter and compressor.	
Check 25A fuse (Part No.F01). NG → Replace fuse. OK	Check	• Check whether 25A fuse on the control board assembly is blown or not. (F01)	If fuse was blown, be sure to check the electrolytic capacitor and diode block. (DB01)
Check electrolytic capacitor, diode block (DB01), etc.	Check		• Connect discharge resistance (approx. 100Ω, 40W) or soldering iron (plug) between +, – terminals of the electrolytic capacitor (760μF) of C14 (with printed CAUTION HIGH VOLTAGE) on P.C. board.
Check terminal voltage of electrolytic capacitor. NG → Check electrolytic capacitor, diode (DB01), etc. OK			Discharging position (Discharging period 10 seconds or more) Plug of soldering iron 
Does outdoor fan rotate? NO → Remove connector CN300 of outdoor fan motor, and using a tester, check resistance value between every phases at motor side. NG → Replace outdoor fan motor. OK → B. YES → A	Operation	Turn on the power breaker, and operate the air conditioner in COOL mode by time shortening.	OK if 760μF → DC280 to 380V
	Measurement	Measure terminal voltage of the electrolytic capacity.	Remove CN300 while pushing the part indicated by an arrow because CN300 is a connector with lock.
		760μF:400WV × 3	
	Check	After operation, turn off the power breaker after 2 minutes 20 seconds passed, and discharge the electrolytic capacitor by soldering iron. Check voltage between motor phases.	
	Stop		
	Check Measurement	• Is not winding between ①-②, ②-③, or ①-③ opened or short-circuited?	→ Resistance between phases should be approx. 55 to 77Ω
		• Is not frame grounded with ①, ②, or ③?	→ Should be 10MΩ or more.

Diagnosis/Process flowchart	Item	Contents	Summary
	Check	Check winding resistance between phases of compressor, and resistance between outdoor frames by using a tester. • Is not grounded. • Is not short-circuited between windings. • Winding is not opened.	→ OK if 10MΩ or more } → OK if 0.51Ω → 0.57Ω (Check by a digital tester.)
	Operation	Remove connector CN300 of the outdoor fan motor, turn on the power supply breaker, and perform the operation. (Stops though activation is prompted.) Check operation within 2 minutes 20 seconds after activation stopped.	

11-10. Inspection of the Main Parts

11-10-1. Inspection of the P.C. Board (Indoor Unit)

CAUTION

(1) Operating precautions

1) When removing the front panel or the P.C. board, be sure to shut off the power supply breaker.
2) When removing the P.C. board, hold the edge of the P.C. board and do not apply force to the parts.
3) When connecting or disconnecting the connectors on the P.C. board, hold the whole housing. Do not pull at the lead wire.

(2) Inspection procedures

1) When a P.C. board is judged to be defective, check for disconnection, burning, or discoloration of the copper foil pattern or this P.C. board.
2) The P.C. board consists of the following 2 parts

a. Main P.C. board part :

DC power supply circuit (5V, 12V, 35V), Indoor fan motor control circuit, CPU and peripheral circuits, buzzer, and Driving circuit of louver.

b. Indication unit of infrared ray receiving infrared ray receiving circuit, LED :

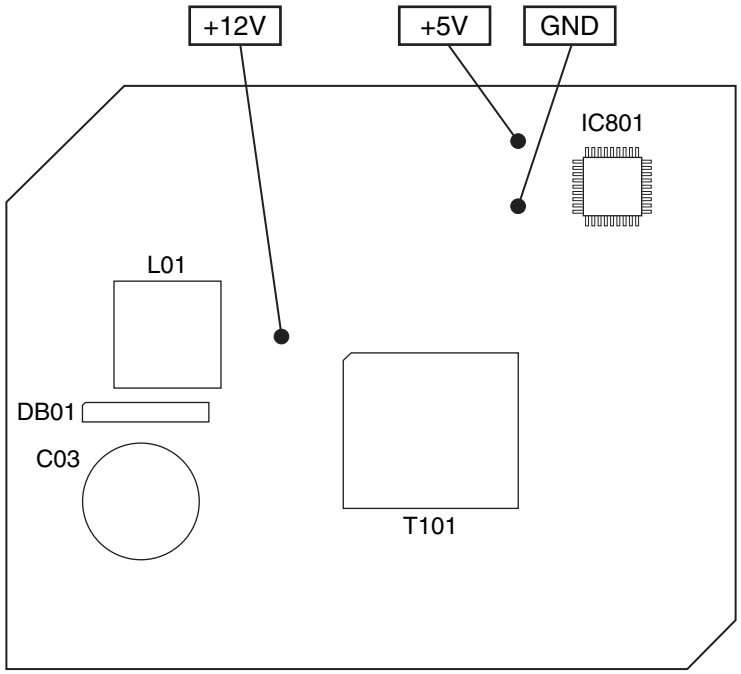
To check defect of the P.C. board, follow the procedure described below.

(3) Check procedures

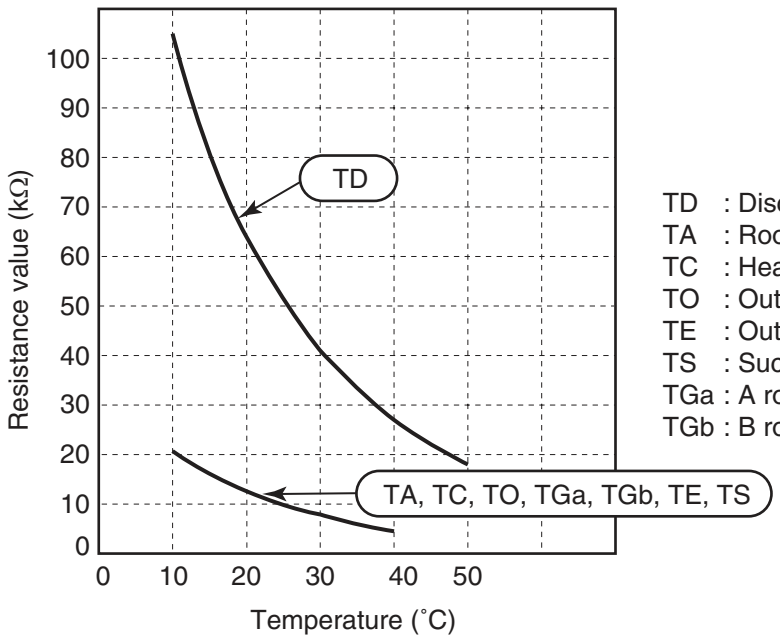
Table 11-10-1

No.	Procedure	Check points	Causes
1	Turn off the power supply breaker and remove the P.C. board assembly from electronic parts base. Remove the connecting cables from the terminal block.	Check whether or not the fuse (F01) is blown.	Impulse voltage was applied or the indoor fan motor short-circuited.
2	Remove the connector of the motor and turn on the power supply breaker. If OPERATION indicator flashes (once per second), it is not necessary to check steps (1 to 3) in the right next column.	Check power supply voltage : 1. Between No. 1 and No. 3 of CN301 (AC 220–240V) 2. Between ⊕ and ⊖ of C03 (DC 310–340V) 3. Between ⊖ of IC122 and output side of IC122 (DC 15V) 4. Between 12V and GND 5. Between 5V and GND	1. The terminal block or the crossover cable is connected wrongly. 2. The capacitor (C01), line filter (L01), resistor (R02), or the diode (DB01) is defective. 3. IC101, IC122 and T101 are defective. 4. IC101, IC121, IC122 and T101 are defective.
3	Push [START/STOP] button once to start the unit. (Do not set the mode to On-Timer operation.)	Check power supply voltage : 1. Between CN03 and CN501 (DC 15–60V)	IC501 and IC502 are defective.
4	Shorten the restart delay timer and start unit.	Check whether or not all indicators (OPERATION, TIMER, PURE) are lit for 3 seconds and they return to normal 3 seconds later.	The indicators are defective or the housing assembly (CN261) is defective.
5	Push [START/STOP] button once to start the unit, • Shorten the restart delay timer. • Set the operation mode to COOL. • Set the fan speed level to AUTO. • Set the preset temperature much lower than the room temperature. (The unit (compressor) operates continuously in the above condition.)	1. Check whether or not the compressor operates. 2. Check whether or not the OPERATION indicator flashes.	1. The temperature of the indoor heat exchanger is extremely low. 2. The connection of the heat exchanger sensor is loose. (The connector is disconnected.) (CN602) 3. The heat exchanger sensor and the P.C. board are defective. (Refer to Table 11-3-1.) 4. The main P.C. board is defective.
6	If the above condition (No. 5) still continues, start the unit in the following condition. • Set the operation mode to HEAT. • Set the preset temperature much higher than room temperature.	1. Check whether or not the compressor operates. 2. Check whether or not the OPERATION indicator flashes.	1. The temperature of the indoor heat exchanger is extremely high. 2. The connection of the heat exchanger sensor short-circuited. (CN602) 3. The heat exchanger sensor and the P.C. board are defective. (Refer to Table 11-3-1.) 4. The main P.C. board is defective
7	Connect the motor connector to the motor and turn on the power supply. Start the unit the following condition. • Set the fan speed level to HIGH. (The unit (compressor) operates continuously in the above condition in No. 5.)	1. Check it is impossible to detect the voltage (DC 15V) between 3 and 4 of the motor terminals. 2. The motor does not operate or the fan motor does not rotate with high speed. (But it is possible to receive the signal from the remote controller.) 3. The motor rotates but vibrates strongly.	1. The indoor fan motor is defective. (Protected operation of P.C. board.) 2. The P.C. board is defective. 3. The connection of the motor connector is loose.

11-10-2. P.C. Board Layout

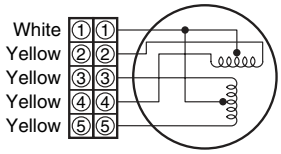


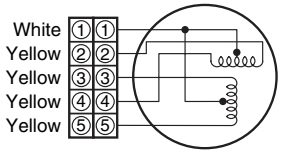
[1] Sensor characteristic table



TD : Discharge temp. sensor
TA : Room temp. sensor
TC : Heat exchanger temp. sensor
TO : Outdoor temp. sensor
TE : Outdoor heat exchanger temp. sensor
TS : Suction temp. sensor
TGa : A room Gas side temp. sensor
TGb : B room Gas side temp. sensor

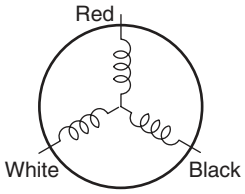
11-10-3. Indoor Unit (Other Parts)

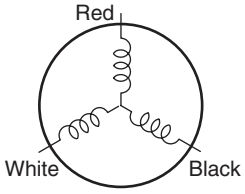
<table>
<tr><th>No.</th><th>Part name</th><th>Checking procedure</th></tr>
<tr><td>1</td><td>Room temp. (TA) sensor
Heat exchanger (TC) sensor
Heat exchanger (TCj) sensor</td><td>Disconnect the connector and measure the resistance value with tester.
(Normal temp.)
<table>
<tr><th>Temperature / Sensor</th><th>10°C</th><th>20°C</th><th>25°C</th><th>30°C</th><th>40°C</th></tr>
<tr><td>TA, TC, TCj (kΩ)</td><td>20.7</td><td>12.6</td><td>10.0</td><td>7.9</td><td>4.5</td></tr>
</table></td></tr>
<tr><td>2</td><td>Remote controller</td><td>Refer to page 82. Troubleshooting for Remote Controller</td></tr>
<tr><td>3</td><td>Louver motor
(right, left, Horizontal)
MP24Z3N</td><td>Measure the resistance value of each winding coil by using the tester.
(Under normal temperature 25°C)
 

<table>
<tr><th>Position</th><th>Resistance value</th></tr>
<tr><td>1 to 2
1 to 3
1 to 4
1 to 5</td><td>250 ± 20Ω</td></tr>
</table></td></tr>
<tr><td>4</td><td>Louver motor (Moving panel)
MP24Z4N</td><td>Measure the resistance value of each winding coil by using the tester.
(Under normal temp. 25°C)
 

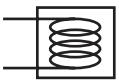
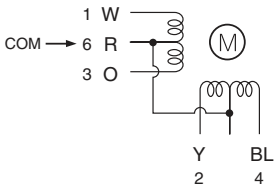
<table>
<tr><th>Position</th><th>Resistance value</th></tr>
<tr><td>1 to 2
1 to 3
1 to 4
1 to 5</td><td>200 ± 20Ω</td></tr>
</table></td></tr>
<tr><td>5</td><td>Indoor fan motor</td><td>Refer to page 80. Only the Indoor Motor Fan Does not Operate.
Refer to page 81.
Indoor Fan Motor Automatically Starts to Spin by Turning on Power Supply.</td></tr>
</table>

11-10-4. Outdoor Unit

<table>
<tr><th>No.</th><th>Part name</th><th>Checking procedure</th></tr>
<tr><td>1</td><td>Compressor
(Model : DA130A1F-25F)</td><td>Measure the resistance value of winding by using the tester.
 

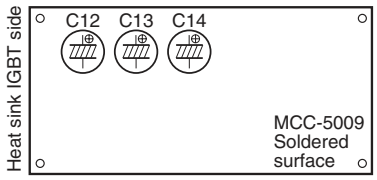
<table>
<tr><th>Position</th><th>Resistance value</th></tr>
<tr><td>Red - White</td><td rowspan="3">0.68 to 0.78 Ω</td></tr>
<tr><td>White - Black</td></tr>
<tr><td>Black- Red</td></tr>
</table>
Under 20°C</td></tr>
<tr><td>2</td><td>Outdoor fan motor
(Model : ICF-140-43-4R)</td><td>Measure the resistance value of winding by using the tester.
 

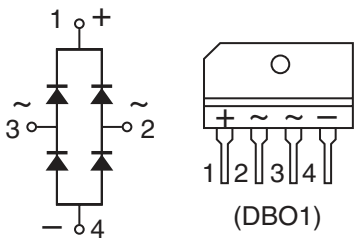
<table>
<tr><th>Position</th><th>Resistance value</th></tr>
<tr><td>Red - White</td><td rowspan="3">20 to 22 Ω</td></tr>
<tr><td>White - Black</td></tr>
<tr><td>Black- Red</td></tr>
</table></td></tr>
<tr><td>3</td><td>Compressor thermo. bimetal type
(Model : US-622KXTMQO-SS)</td><td>Check conduction by using the tester.</td></tr>
</table>

<table>
<tr><th>No.</th><th>Part name</th><th>Checking procedure</th></tr>
<tr><td>4</td><td>Outdoor temperature sensor (TO), discharge temperature sensor (TD), suction temperature sensor (TS), outdoor heat exchanger temperature sensor (TE), A room gas side temperature sensor (TGa), B room gas side temperature sensor (TGb)</td><td>Disconnect the connector, and measure resistance value with the tester. (Normal temperature)
<table>
<tr><th>Sensor \ Temperature</th><th>10°C</th><th>20°C</th><th>25°C</th><th>30°C</th><th>40°C</th></tr>
<tr><td>TD (kΩ)</td><td>100</td><td>64</td><td>41</td><td>27</td><td>18</td></tr>
<tr><td>TGa, TGb (Cooling only)
TO, TE, TS (kΩ)</td><td>20.6</td><td>12.6</td><td>10.0</td><td>5.1</td><td>3.4</td></tr>
<tr><td>TGa, TGb (Heat Pump) (kΩ)</td><td>20.5</td><td>12.5</td><td>10.0</td><td>5.3</td><td>3.6</td></tr>
</table></td></tr>
<tr><td>5</td><td>4-way valve coil
(Model :STF)</td><td>Measure the resistance value of winding by using the tester.

<table>
<tr><th>Resistance value</th></tr>
<tr><td>1435 ± 144 Ω</td></tr>
</table>
Under 20°C</td></tr>
<tr><td>6</td><td>Pulse motor valve coil
(Model : CAM-MD12TF-12)</td><td>Measure the resistance value of winding by using the tester.


<table>
<tr><th>Position</th><th>Resistance value</th></tr>
<tr><td>Red - White</td><td rowspan="4">42 to 50 Ω</td></tr>
<tr><td>White - Orange</td></tr>
<tr><td>Red - Yelloow</td></tr>
<tr><td>Red - Blue</td></tr>
</table>
Under 20°C</td></tr>
</table>

11-10-5. Checking Method for Each Part

<table>
<tr><th>No.</th><th>Part name</th><th>Checking procedure</th></tr>
<tr><td>1</td><td>Electrolytic capacitor
(For boost, smoothing)</td><td>1. Turn OFF the power supply breaker.
2. Discharge all three capacitors completely.
3. Check that safety valve at the bottom of capacitor is not broken.
4. Check that vessel is not swollen or exploded.
5. Check that electrolytic liquid does not blow off.
6. Check that the normal charging characteristics are shown in continuity test by the tester.


<table>
<tr><th>Case that product is good</th></tr>
<tr><td>Pointer swings once, and returns slowly.
When performing test once again under another polarity, the pointer should return.</td></tr>
</table>
C12, C13, C14 → 760μF/400V</td></tr>
<tr><td>2</td><td>Diode block</td><td>1. Turn OFF the power supply breaker.
2. Completely discharge the four electrolytic capacitors.
3. Remove the diode block from the PCB (which is soldered in place).
4. Use a multimeter with a pointer to test the continuity, and check that the diode block has the proper rectification characteristics.


(DBO1)
<table>
<tr><th colspan="2">Tester rod</th><th rowspan="2">Resistance value in good product</th></tr>
<tr><th>⊕</th><th>⊖</th></tr>
<tr><td>~ 2</td><td rowspan="2">+ 1</td><td rowspan="4">∞</td></tr>
<tr><td>~ 3</td></tr>
<tr><td rowspan="2">– 4</td><td>~ 2</td></tr>
<tr><td>~ 3</td></tr>
</table>
10 to 20 Ω when the multimeter probe is reversed</td></tr>
</table>

11-11. How to Simply Judge Whether Outdoor Fan Motor is Good or Bad

1. Symptom

- Outdoor fan motor does not rotate.
- Outdoor fan motor stops within several tens seconds though it started rotating.
- Outdoor fan motor rotates or does not rotate according to the position where the fan stopped, etc.

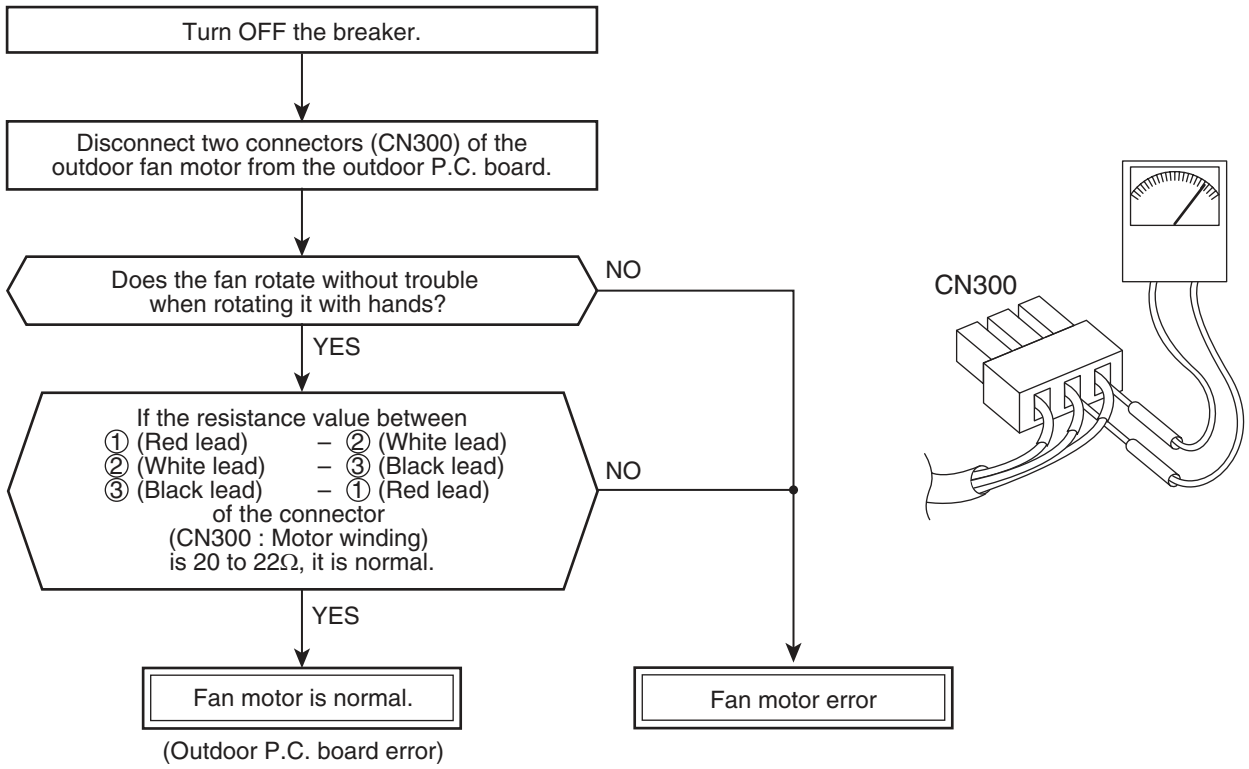
Remote controller check code “02 : Outdoor block, 1A : Outdoor fan drive system error”

2. Cause

The following causes are considered when the outdoor fan motor does not normally rotate.

1) Mechanical lock of the outdoor fan motor
2) Winding failure of the outdoor fan motor
3) Position-detect circuit failure inside of the outdoor fan motor
4) Motor drive circuit failure of the outdoor P.C. board

3. How to simply judge whether outdoor fan motor is good or bad


Turn OFF the breaker.
Disconnect two connectors (CN300) of the outdoor fan motor from the outdoor P.C. board.
Does the fan rotate without trouble when rotating it with hands?
NO
YES
If the resistance value between
① (Red lead) – ② (White lead)
② (White lead) – ③ (Black lead)
③ (Black lead) – ① (Red lead)
of the connector
(CN300 : Motor winding)
is 20 to 22Ω, it is normal.
NO
YES
Fan motor is normal.
(Outdoor P.C. board error)
Fan motor error
CN300

NOTE:

However, GND circuit error inside of the motor may be accepted in some cases when the above check is performed.

When the fan motor does not become normal even if P.C. board is replaced, replace the outdoor fan motor.

12. HOW TO REPLACE THE MAIN PARTS

12-1. Indoor Unit

⚠ WARNING	
	Since high voltages is applied to electrical parts, turn off the power without fail before starting replacement work.
CHECK	**After repairs have been completed and the front panel and cabinet have been attached, perform test run and check for smoke, unusual sound, and other abnormalities.** Failure to do so may cause fire or electric shock. Make sure that the cabinet is attached before starting test run.
WATCH OUT FOR FIRE	**Perform the following when repairing the refrigeration cycle.** • Watch out for fire in the surrounding area. If a gas stove or other appliance is being used, extinguish the flames before starting work. If the flames are not extinguished, they may ignite oil mixed with the refrigerant gas and may cause fire or burn injury. • Do not use welding equipment in an airtight room. Carbon monoxide poisoning may be caused if the room is not well ventilated. • Do not use welding equipment near flammable materials. Flames from the equipment may cause the flammable materials to catch fire and may result in fire or burn injury.

⚠ CAUTION	
WEAR GLOVES	**Wear thick gloves such as cotton work gloves during repair work.** **Failure to do so may cause injury by parts.**

12-1-1. Removing the Front Panel and Moving Panel

1) Open the moving panel, and support the moving panel by the panel support on the right side.

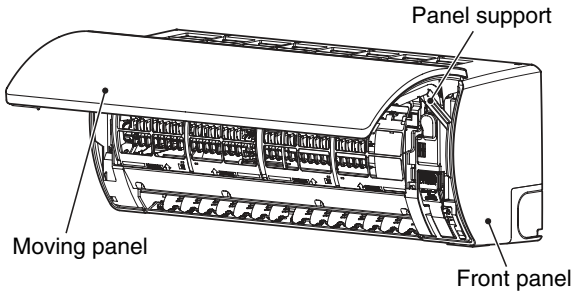


Fig. 12-1-1

2) Remove the four set screws on the front panel.

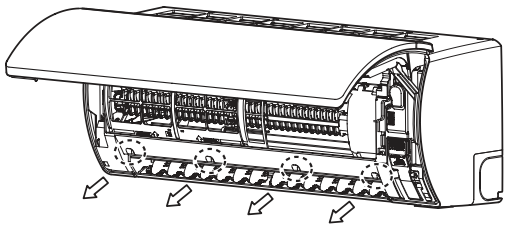


Fig. 12-1-2

3) Insert your thumb into the air outlet bottom section, and lift up the front panel bottom.

4) Close the moving panel to remove the clips on the top side as shown below.

Push your finger down on the clip on the front panel top, and lift up the panel back edge so that the clip is released (5 locations).

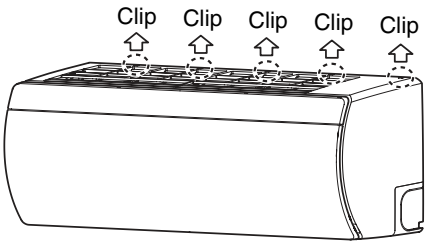


Fig. 12-1-3

12-1-2. Fixing Frame Assembly

1) Detach the two air filters.
2) Disconnect the plasma ion charger connector and the earth lead (black). (The earth lead is connected to the heat exchanger with a screw.)
3) Remove the two screws securing the fixing frame to the rear of the indoor unit.

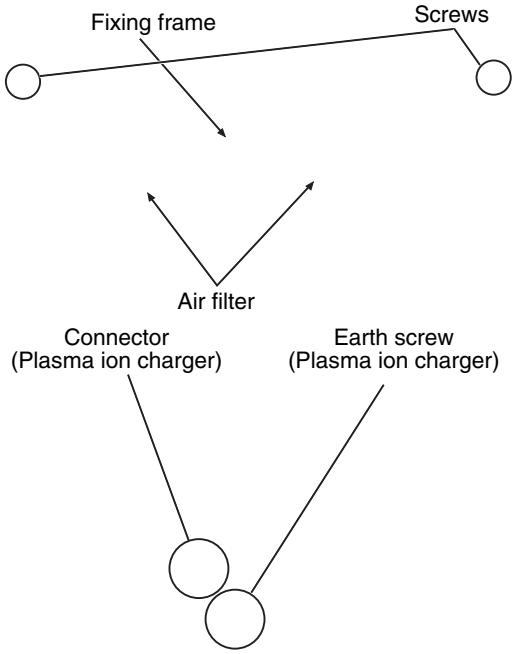


Fig. 12-1-4

4) While turning the upper part of the fixing frame to the front, release the front claw of the fixing frame from the rear of the indoor unit.

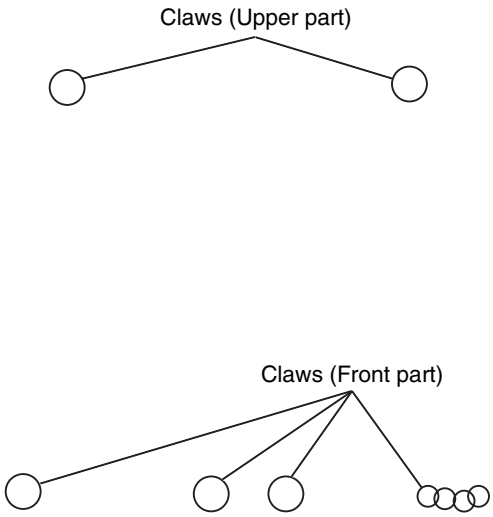


Fig. 12-1-5

12-1-3. Electric Parts Cover Detached

1) Perform work of Detachment **12-1-1. Removing the Front Panel and Moving Panel**.
2) Remove the screw beside the screw that secures the electric parts box assembly.
3) Remove the connector cover screws and detach the connector cover.
4) While pushing the claw of the lead wire cover in the direction shown in the figure, lift the bottom of the lead wire cover to detach it.
5) Disconnect the connectors below.
   - Louver motor connector (24P) for louver
   - Fan motor connector (5P)
   - Louver motor connector (5P) for movable panel
   - Minus ion charger connector (4P)
6) Remove the motor base assembly by releasing the claw.
7) Remove the earth screw, TC sensor, and TCj sensor.

CAUTION

When attaching the electric parts assembly

- Insert the projection at the rear of the indoor unit into the upper hole in the electric parts assembly.
- Check that the fan motor lead wires are connected as shown in the figure.

When attaching the motor base assembly

- Before attaching the motor base assembly, connect the earth wire and install the TC and TCj sensors.
- Insert the bottom of the motor base assembly into the portion shown in the figure.
- Insert the motor cover projection into the hole in the right side panel of the motor base assembly.

12-1-4. Microcomputer P.C. Board

1) Remove the electric parts cover screw.
2) Detach the metal electric parts cover.
3) Disconnect the connectors from the P.C. board.
4) Disconnect the solderless terminals from the P.C. board.
5) Remove the P.C. board.

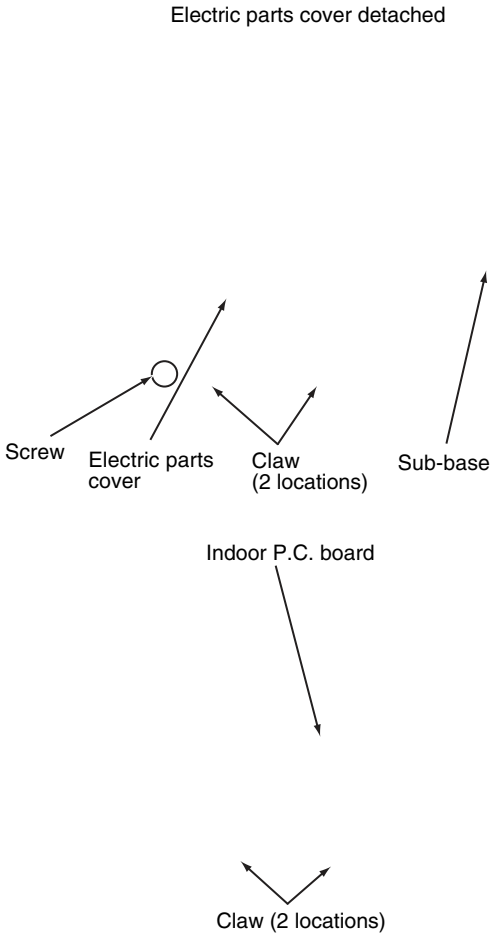


Fig. 12-1-6

12-1-5. Louver

1) Open the moving panel, and support it with the panel support.
2) Open the vertical air flow louver.
3) Insert a flathead screwdriver into the gap of the louver fixture on the right and left ends of the vertical air flow louver, and turn in the counter-clockwise direction to remove.

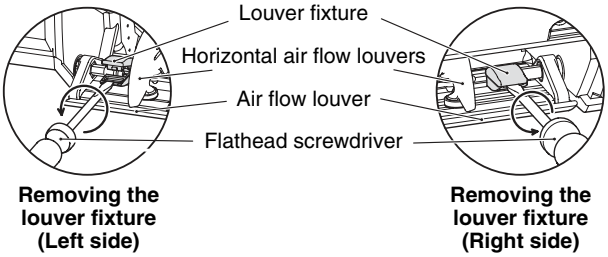


Fig. 12-1-7

4) After pushing in the right and left connector joints, remove the vertical air flow louvres.

   Remove the centre joint and bend the louver downward.

   Remove the right side joint first, and then, remove the left side joint.

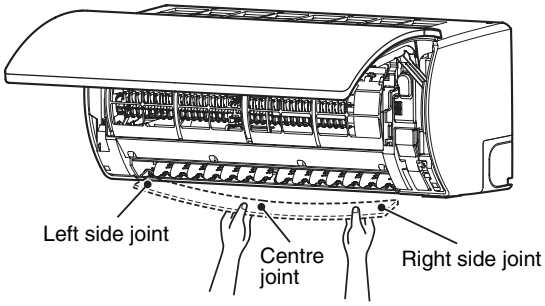


Fig. 12-1-8

12-1-6. Heat Exchanger

1) Perform work of Detachment **12-1-1. Removing the Front Panel and Moving Panel** and **12-1-2. Fixing Frame Assembly**.
2) Remove the pipe holder at the rear of the unit.
3) Remove the two fixing screws (10 mm) at the left of the heat exchanger.
4) Remove the fixing screw of the heat exchanger fixing holder (upper).
5) Remove the fixing screw of the heat exchanger fixing holder (lower).
6) Release the end plate hook and the claw at the right of the heat exchanger, pull up the heat exchanger, and then remove the fixing holder (lower) from the guide of the indoor unit.

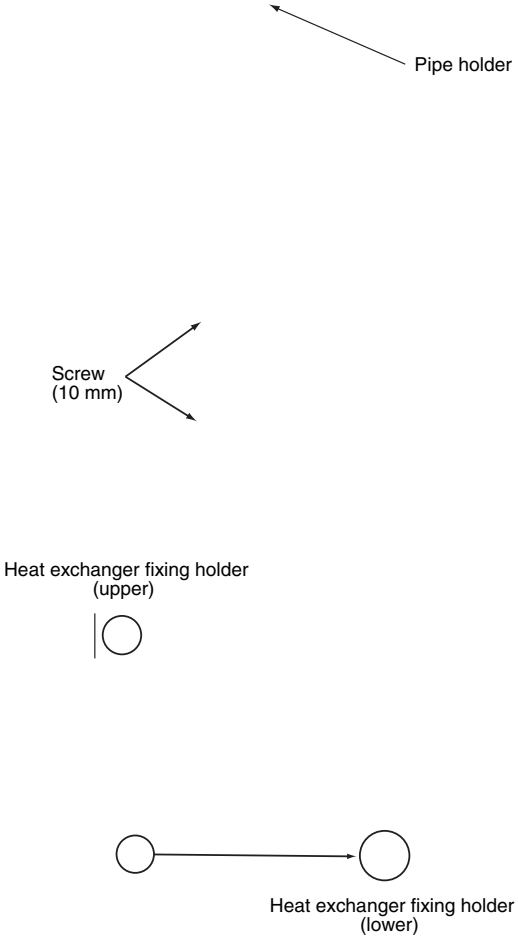


Fig. 12-1-9

CAUTION

Check that the claw is engaged with the end plate hook, and then secure the heat exchanger with screws.

12-1-7. Fan Motor

1) Perform work of Detachment **12-1-1. Removing the Front Panel and Moving Panel** and **12-1-3. Electric Parts Cover Detached**.
2) Loosen the hexagon socket set screw of the cross flow fan from the air outlet.
3) Remove the two fixing screws of the motor band (right).
4) Pull the motor band (right) and the fan motor out of the unit.

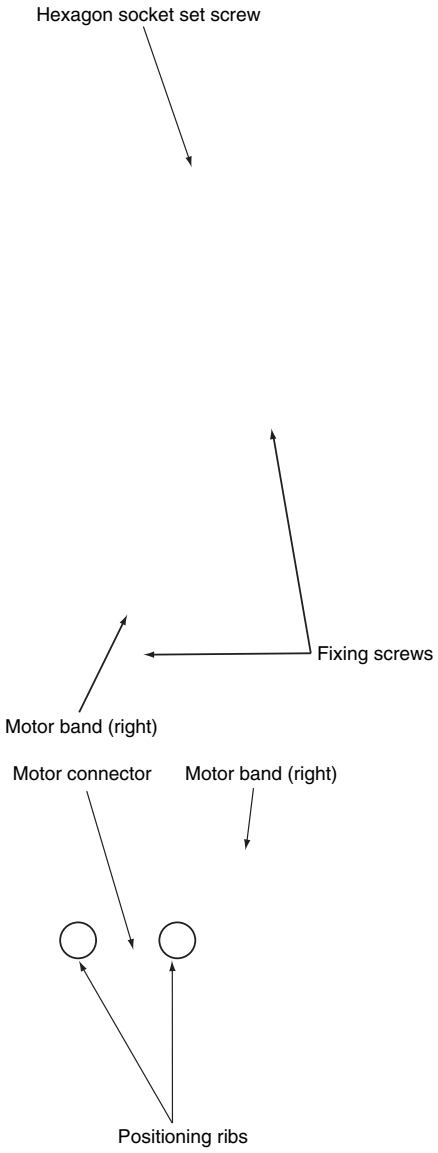


Fig. 12-1-10

CAUTION

Install the fan motor while positioning it so that the fan motor connector comes between the positioning ribs on the motor band (right).

Be sure to tighten the hexagon socket set screw so that it touches the D-cut surface of the fan motor shaft.

12-1-8. Cross Flow Fan

1) Perform work of Detachment **12-1-1. Removing the Front Panel and Moving Panel** and **12-1-2. Fixing Frame Assembly**.
2) Remove the two fixing screws (10 mm) at the left of the heat exchanger end plate, and then remove the two fixing screws (12 mm) of the bearing base assembly.
3) Remove the bearing base while lifting the heat exchanger.
4) Remove the cross flow fan while lifting the heat exchanger.

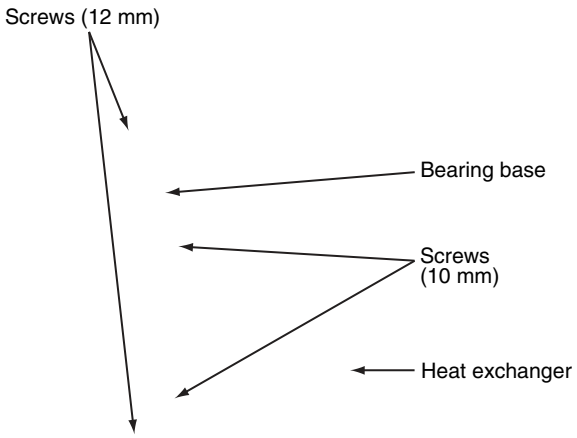


Fig. 12-1-11

CAUTION

Check and perform items 1 and 2 in the following right side.

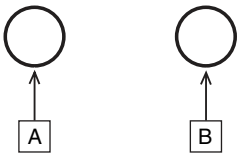


Fig. 12-1-12

1 **Keep 27mm distance between the support shaft at the rear centre of the unit and the immediate right joint-section of the cross flow fan.**

Detail A

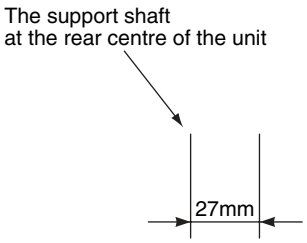


Fig. 12-1-13

2 **Check that the fan motor shaft end projects by 9 mm above the screw boss of the cross flow fan.**

If the motor shaft end is below the screw boss, the cross flow fan may have been assembled improperly.

Check again whether the cross flow fan have been assembled properly.

Detail B

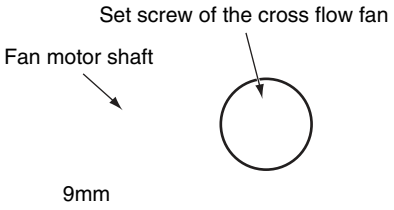


Fig. 12-1-14

3 **Be sure to tighten the hexagon socket set screw so that it touches the D-cut surface of the fan motor shaft.**

12-2. Plasma Ion Charger

12-2-1. Common Procedure

1) Perform work of Detachment **12-1-1. Removing the Front Panel and Moving Panel** for the indoor unit.
2) Detach the two air filters.

12-2-2. Protective Board

1) Remove the screw shown in the figure.
2) Shift the protective board to the left.
3) Pull the protective board toward you to remove it.

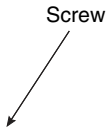


Fig. 12-2-1

12-2-3. High-voltage Power Supply Unit and Discharger Unit

1) Perform work of Detachment **12-1-1. Removing the Front Panel and Moving Panel**.
2) Disconnect the 4P connector on the high-voltage power supply unit.
3) Remove the screw securing the earth lead (black).
4) While pushing down the hook at the upper part of the high-voltage power supply unit, detach the upper part of the power supply unit.
5) Lift the high-voltage power supply unit, and pull the projection at the bottom of the high-voltage power supply unit out of the fixing frame.

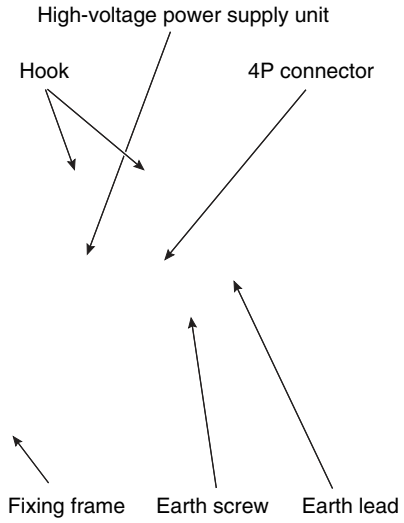


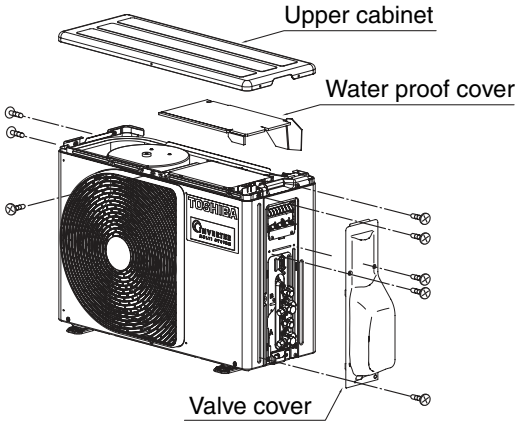
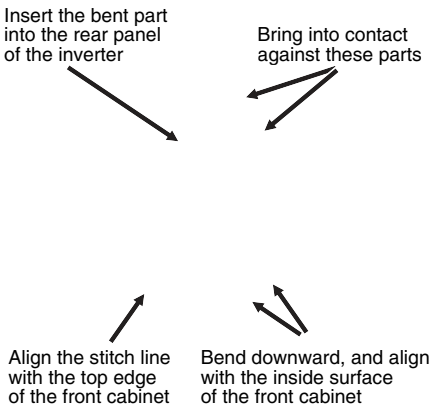
Fig. 12-2-2

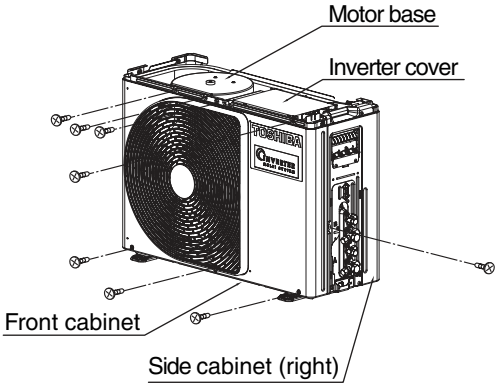
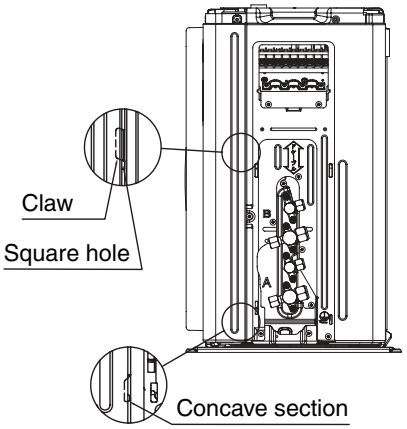
CAUTION

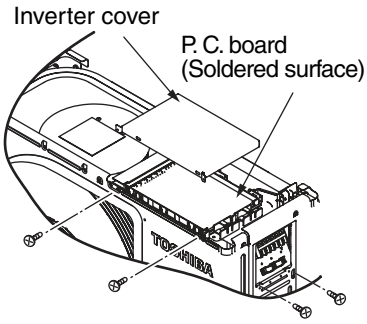
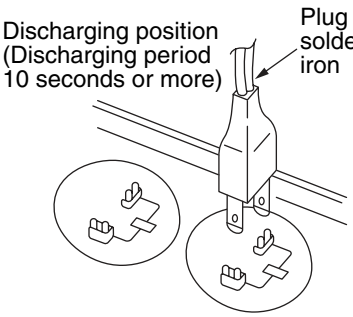
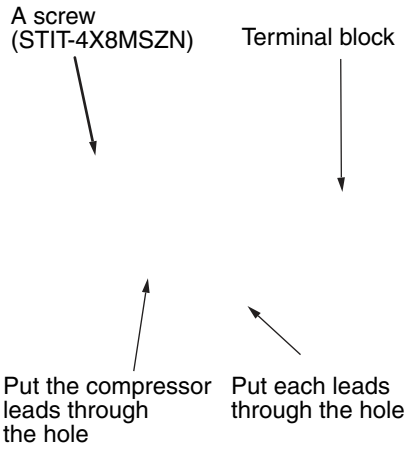
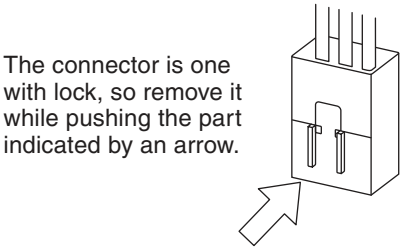
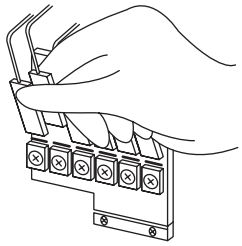
Carry out this work taking care of the end of the sheet metal on the back of the discharger unit.

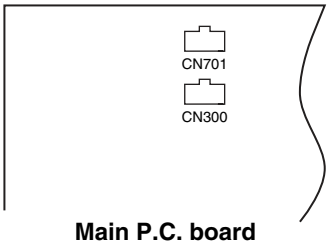
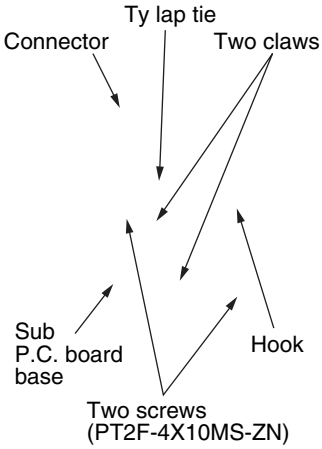
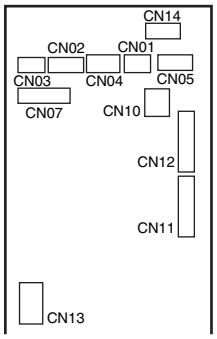
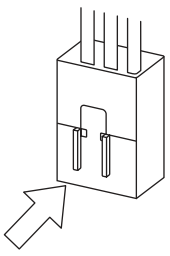
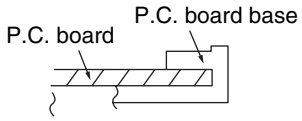
6) Gently warp the centre of the discharger unit downward, and disengage the upper projection from the fixing frame.
7) Gently warp the centre of the discharger unit upward, and disengage the lower projection from the fixing frame.
8) Hold the hook at the left of the discharger unit, and lift the discharger unit to remove it.

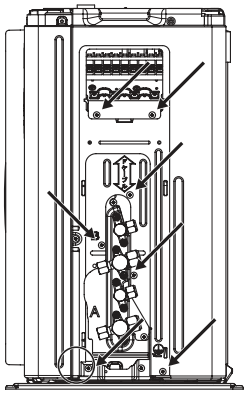
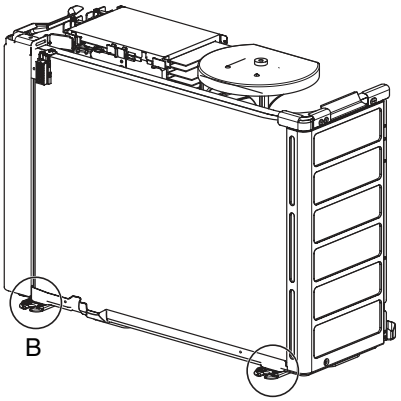
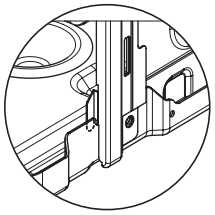
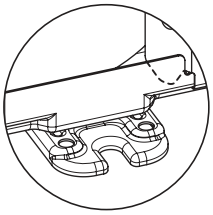
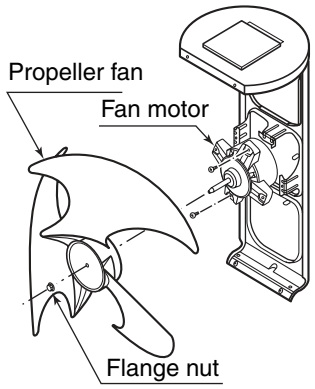
12-3. Outdoor Unit

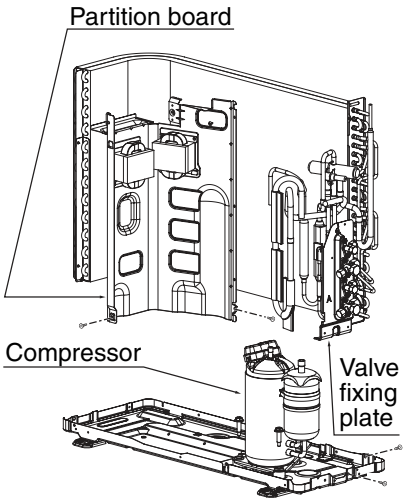
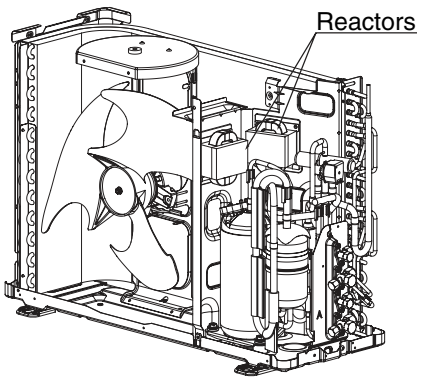
No.	Part name	Procedure	Remarks
①	Common procedure	**1. Detachment** **NOTE** **Wear gloves for this job.** **Otherwise, you may injure your hands on the parts, etc.** 1) Stop operation of the air conditioner, and turn off the main switch of the breaker for air conditioner. 2) Remove the valve cover. (ST1TØ4 × 8L 3 pcs.) • After removing screw, remove the valve cover pulling it downward. 3) Remove the upper cabinet. (ST1TØ4 × 8L 5 pcs.) • After removing screws, remove the upper cabinet pulling it upward. **2. Attachment** 1) Attach the water-proof cover. **NOTE** **The water-proof cover must be attached without fail in order to prevent rain water, etc. from entering inside the indoor unit.** 2) Attach the upper cabinet. (ST1TØ4 × 8L 5 pcs.) 3) Perform cabling of connecting cable. 4) Attach the valve cover. (ST1TØ4 × 8L 3 pcs.) • Insert the upper part into the square hole of the side cabinet, set hook claws of the valve cover to square holes (at three positions) of the main unit, and attach it pushing upward.	  **How to mount the water-proof cover**

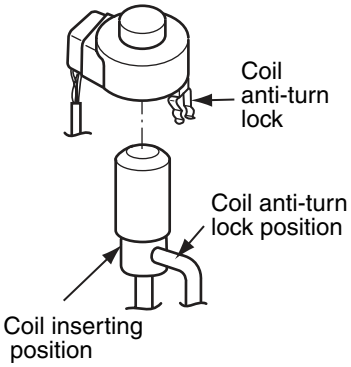
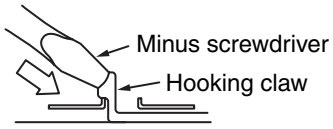
No.	Part name	Procedure	Remarks
②	Front cabinet	**1. Detachment** 1) Perform step 1 in ①. 2) Remove the fixing screws (ST1TØ4 × 8L 2 pcs.) used to secure the front cabinet and inverter cover, the screws (ST1TØ4 ×8L 3 pcs.) used to secure the front cabinet at the bottom, the fixing screws (ST1TØ4 × 8L 2 pcs.) used to secure the motor base, and the fixing screws (ST1TØ4 × 8L 1 pc.) used to secure the side cabinet (right). • The front cabinet is fitted into the side cabinet (left) at the front left side so pull up the top of the front cabinet to remove it. **2. Attachment** 1) Insert the claw on the front left side into the side cabinet (left). 2) Hook the bottom part of the front right side onto the concave section of the bottom plate. Insert the claw of the side cabinet (right) into the square hole in the front cabinet. 3) Return the screws that were removed above to their original positions, and attach them.	 

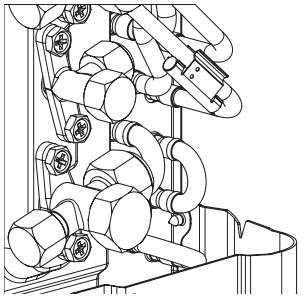
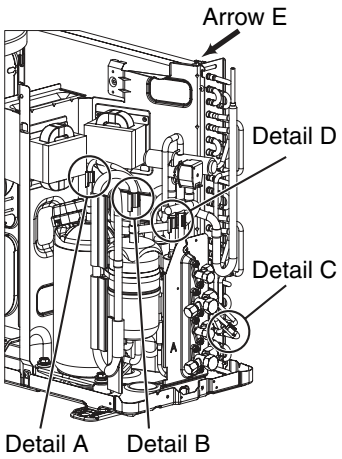
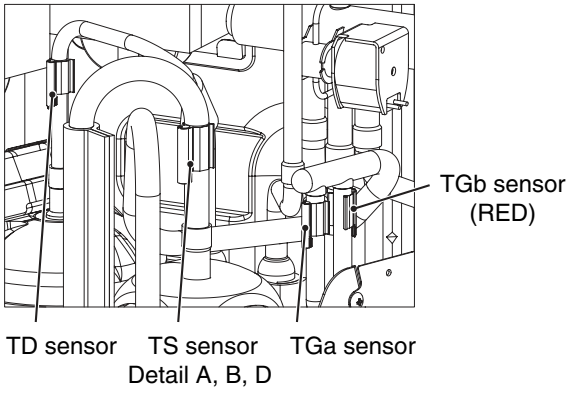
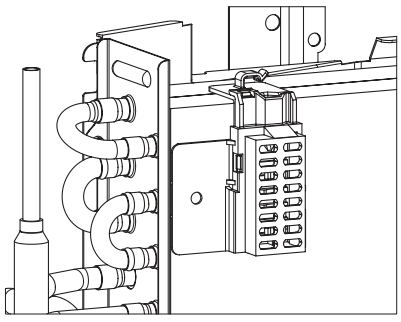
No.	Part name	Procedure	Remarks
③	Inverter assembly	1) Perform work of item 1 in ①. 2) Remove screw (ST1TØ4 × 8L 2 pcs.) of the upper part of the front cabinet. • If removing the inverter cover in this condition, P.C. board can be checked. • If there is no space above the unit, perform work of 1 in ②. **Be careful to check the inverter because high-voltage circuit is incorporated in it.** 3) Perform discharging by connecting ⊕, ⊖ polarity by discharging resistance (approx. 100Ω 40W) or plug of soldering iron to, ⊕, ⊖ terminals a of the C14 (printed "CAUTION HIGH VOLTAGE" is attached.) electrolytic capacitor (760μF) on P.C. board. **Be careful to discharge the capacitor because the electrolytic capacitor cannot naturally discharge and voltage remains according to trouble type in some cases.** **NOTE** **This capacitor is one with mass capacity. Therefore, it is dangerous that a large spark generates if short-circuiting between ⊕, ⊖ polarity with screwdriver, etc. for discharging.** 4) Remove the front cabinet by performing step 1 in ②, and remove the fixing screws (ST1TØ4 × 8L) for securing the main body and inverter box. 5) Remove screw (ST1TØ4 × 8L 2 pcs.) fixing the main body and the inverter box. 6) Remove various lead wires from the holder at upper part of the inverter box. 7) Pull the inverter box upward. 8) Disconnect connectors of various lead wires. **Requirement** **As each connector has a lock mechanism, avoid to remove the connector by holding the lead wire, but by holding the connector.**	     Be sure to remove the connector by holding the connector, not by pulling the lead wire.

No.	Part name	Procedure	Remarks
④	Control board assembly	1. Disconnect the leads and connectors connected to the other parts from the control board assembly. 1) Leads • 3 leads (black, white, orange) connected to terminal block. • Lead connected to compressor : Disconnect the connector (3P). • Lead connected to reactor : Disconnect the two connectors (2P). 2) Connectors (×8) **Main P.C. board** CN300 : Outdoor fan motor (3P: white)* (See **NOTE**) CN701 : 4-way valve (2P: yellow)* **Sub P.C. board** CN01 : TE sensor (2P: white)* CN11 : PMW (6P: white) CN12 : PMV (6P: red) CN04 : TS sensor (3P: white)* CN02 : TD sensor (3P: white)* CN03 : TO sensor (2P: white) CN05 : TGa sensor (3P: yellow) CN14 : TGb sensor (3P: red) CN10 : Case thermo (2P: blue)* CN07 : Lead for communication CN13 : Lead for AC power supply **NOTE** These connectors have a disconnect prevention mechanism: as such, the lock on their housing must be released before they are disconnected. 2. Remove the control board assembly from the P.C. board base. (Remove the heat sink and control board assembly while keeping them screwed together.) **NOTE** Disengage the four claws of the P.C. board base, hold the heat sink, and lift to remove it. 3. Remove the two fixing screws used to secure the heat sink and control board assembly. 4. Mount the new control board assembly. **NOTE** When mounting the new control board assembly, ensure that the P.C. board is inserted properly into the P.C. board support groove. 5. Disconnect the connectors. 6. Remove the two screws (PT2F-4X10MS-ZN), then remove the Sub P.C. board base while disengaging the claws from the square holes. 7. Disengage the two claws of the Sub P.C. board base and remove the Sub P.C. board.	 **Main P.C. board**   **Sub P.C. board** CN300, CN701, CN600 and CN603 are connectors with locking mechanisms: as such, to disconnect them, they must be pressed in the direction of the arrow while pulling them out.  

No.	Part name	Procedure	Remarks
⑤	Side cabinet	**1. Side cabinet (right)** 1) Perform step 1 in ② and all the steps in ③. 2) Remove the fixing screw (ST1TØ4 × 8L 5 pcs.) used for securing the side cabinet to the bottom plate and valve fixing panel. **2. Side cabinet (left)** 1) Perform step 1 in ②. 2) Remove the fixing screw (ST1TØ4 × 8L 1 pcs.) used to secure the side cabinet (left) onto the heat exchanger. 3) Remove the fixing screw (ST1TØ4 × 8L 2 pc.) used for securing the side cabinet to the bottom plate and heat exchanger.	 A  B C  Detail A Detail B  Detail C
⑥	Fan motor	1) Perform work of item 1 of ① and ②. 2) Remove the flange nut fixing the fan motor and the propeller. • Flange nut is loosened by turning clockwise. (To tighten the flange nut, turn counterclockwise.) 3) Remove the propeller fan. 4) Disconnect the connector for fan motor from the inverter. 5) Remove the fixing screws (2 pc.) holding by hands so that the fan motor does not fall. * <u>Precautions when assembling the fan motor.</u> Tighten the flange nut using a tightening torque of 4.9 N•m.	 Propeller fan Fan motor Flange nut

No.	Part name	Procedure	Remarks
⑦	Compressor	1) Perform work of item 1 of ① and ②, ③, ④, ⑤. 2) Extract refrigerant gas. 3) Remove the partition board. (ST1TØ4 × 8L 3 pcs.) 4) Remove the sound-insulation material. 5) Remove terminal cover of the compressor, and disconnect lead wire of the compressor and the comp. thermo. assembly from the terminal. 6) Remove pipe connected to the compressor with a burner. • Take care to keep the 4-way valve away from naked flames. (Otherwise, it may malfunction.) 7) Remove the fixing screw of the bottom plate and heat exchanger. (ST1TØ4 × 8L 1 pc.) 8) Remove the fixing screw of the bottom plate and valve fixing plate. (ST1TØ4 × 8L 1 pc.) 9) Pull upward the refrigeration cycle. 10) Remove BOLT (3 pcs.) fixing the compressor to the bottom plate. * <u>Precautions when assembling the compressor.</u> Tighten the compressor bolts using a tightening torque of 4.9 N•m.	
⑧	Reactor	1) Perform work of item 1 of ②, and ③. 2) Remove screws fixing the reactor. (ST1TØ4 × 8L 4 pcs.)	

No.	Part name	Procedure	Remarks
⑨	Electronic expansion valve coil	**1. Detachment** 1) Perform step 1 in ②, all the steps in ③ and 1 in ⑤. 2) Remove the coil by pulling it up from the electronic control valve body. **2. Attachment** 1) When assembling the coil into the valve body, ensure that the coil anti-turn lock is installed properly in the pipe. **<Handling precaution>** When handling the parts, do not pull the leads. When removing the coil from the valve body, use your hand to secure the body in order to prevent the pipe from being bent out of shape.	
⑩	Fan guard	**1. Detachment** 1) Perform work of item 1 of ②. 2) Remove the front cabinet, and put it down so that fan guard side directs downward. **Perform work on a corrugated cardboard, cloth, etc. to prevent flaw to the product.** 3) Remove the hooking claws by pushing minus screwdriver according to the arrow mark in the right figure, and remove the fan guard. **2. Attachment** 1) Insert claws of the fan guard in the holes of the front cabinet. Push the hooking claws (9 positions) by hands and fix the claws. **All the attaching works have completed.** **Check that all the hooking claws are fixed to the specified positions.**	

No.	Part name	Procedure	Remarks
⑪	TE sensor (outdoor heat exchanging temperature sensor) • **Attachment** With the sensor leads pointing in the direction shown in the figure, install the sensor onto the straight pipe part of the condenser output pipe.  Detail C TE sensor		
⑫	TS sensor (Suction pipe temperature sensor) • **Attachment** With its leads pointing downward, point the sensor in the direction of the packed valve, and install it onto the straight pipe part of the suction pipe.		
⑬	TD sensor (Discharge pipe temperature sensor) • **Attachment** With its leads pointed downward, install the sensor facing downward onto the vertical straight pipe part of the discharge pipe.		
⑭	TO sensor (Outside air temperature sensor) • **Attachment** Insert the outdoor air temperature sensor into the holder, and install the holder onto the heat exchanger.		
⑮	TGa/TGb sensor (Gas side pipe temperature sensor) • **Attachment** With its leads pointing downward, point the sensor in the direction of the front cabinet, and install the sensor onto the straight pipe part of gas side pipe. Match the sensor protective tube colors with the pipe marking colors and install the sensors. TGb is red.   Arrow E TO sensor **CAUTION** **During the installation work (and on its completion), take care not to damage the coverings of the sensor leads on the edges of the metal plates or other parts. It is dangerous for these coverings to be damaged since damage may cause electric shocks and/or a fire.** After replacing the parts, check whether the positions where the sensors were installed are the proper positions as instructed. The product will not be controlled properly and trouble will result if the sensors have not been installed in their proper positions.		

Outdoor unit

Main P.C. board (MCC-5009)

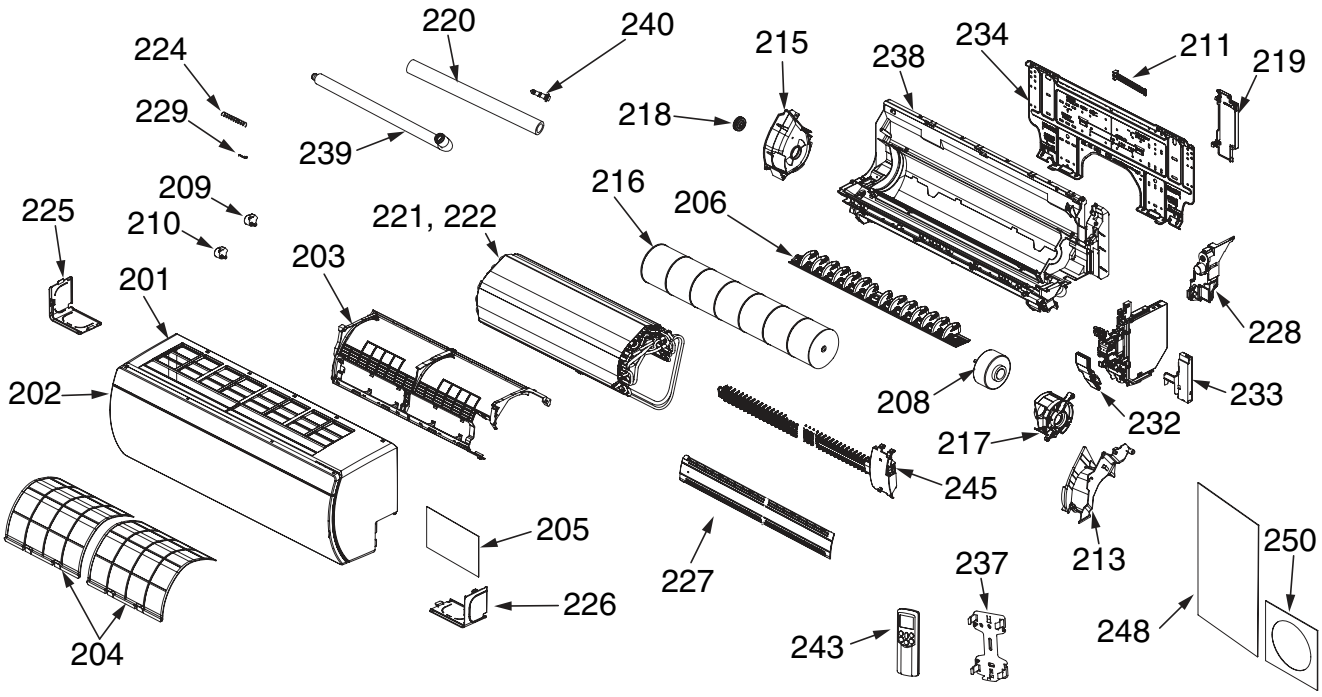
Outdoor unit

Sub P.C. board (MCC-5015-03)

13. EXPLODED VIEWS AND PARTS LIST

13-1. Indoor Unit

RAS-M10PKVP-E, RAS-M13PKVP-E, RAS-M16PKVP-E



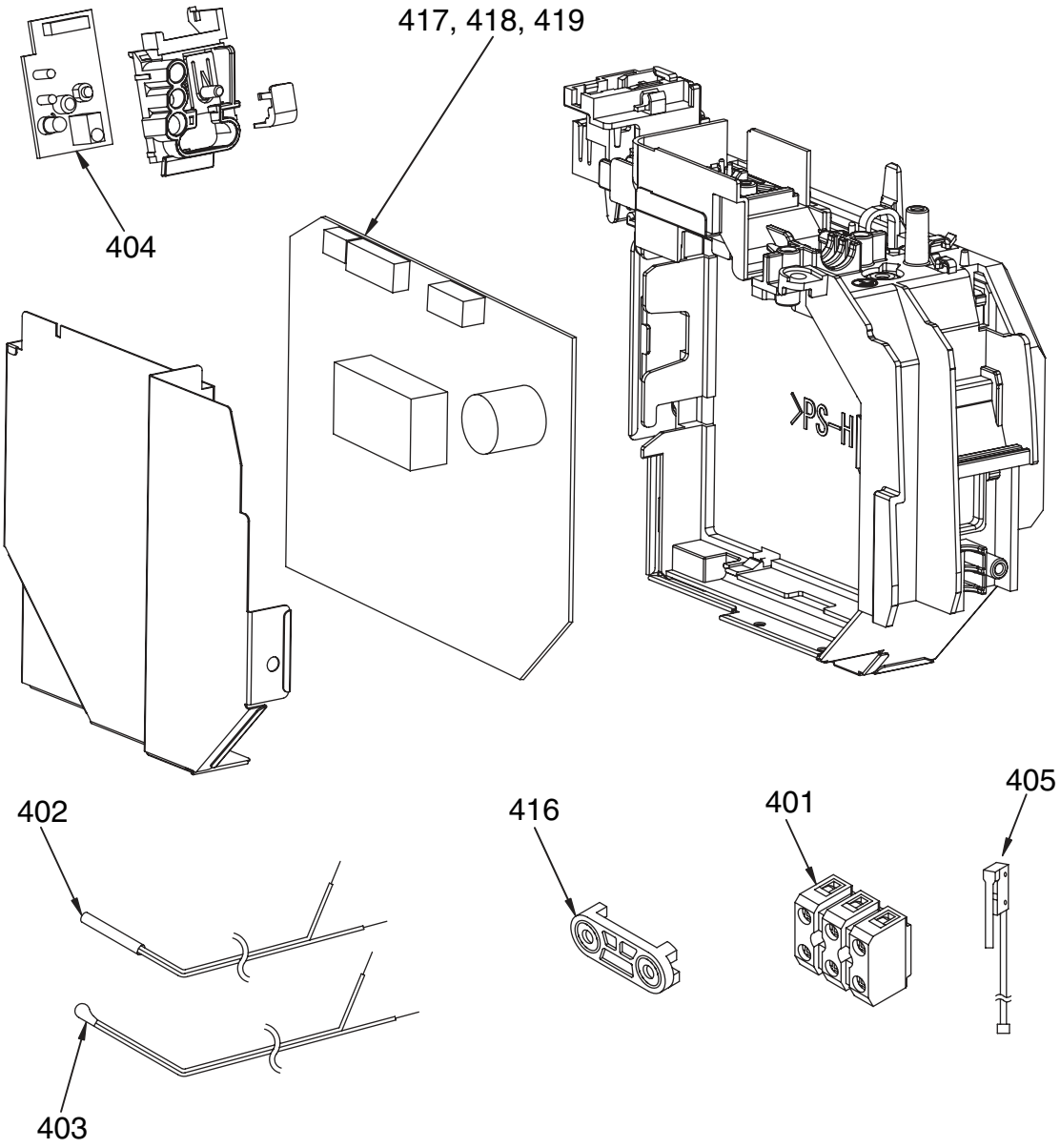
- The parts in the following parts list are conformed to RoHS.
  Therefore be sure to use the following parts for repairing and replacing.

Location No.	Part No.	Description
201	43005779	Panel Ass'y
202	43005778	Frame, Ainl Ass'y
203	4301V098	Fix, Frame Ass'y
204	43080609	Filter, Air
205	4308S232	Wiring Diagram
206	43022455	Louver Ass'y
208	4302C095	Fan Motor Ass'y
209	4302C076	Motor, Louver (For Panel)
210	4302D003	Motor, Louver (For Louver)
211	4306A172	Cord, Motor, Louver
213	4301V104	Cover Ass'y, Motor
215	43022459	Base, Bearing Ass'y
216	43020372	Fan Ass'y, Cross Flow
217	43039376	Band, Motor, Right
218	43125171	Bearing Ass'y, Mold
219	4301V083	Holder, Pipe
220	43049787	Pipe, Shield
221	43044870	Refrigeration Cycle Ass'y (M10,13PKVP-E)

Location No.	Part No.	Description
222	43044876	Refrigeration Cycle Ass'y (M16PKVP-E)
224	43049784	Spring
225	43096255	Panel, Bush (L)
226	43096257	Panel, Bush (R)
227	4301V097	Guard, Plasma Pure Filter
228	4301V089	Base Ass'y, Motor
229	43019904	Holder, Sensor
232	43062276	Connector, Cover Ass'y
233	43062275	Lead, Cover Ass'y
234	43082296	Plate, Installation
237	43083071	Holder, Remote Controller
238	43003323	Body Ass'y, Back
239	43070199	Hose, Drain
240	43079239	Cap, Drain
243	43066024	Remote Controller Wireless
245	43080608	Plasma Pure Filter Ass'y
248	4308S213	Owner's Manual
250	4308S217	Owner's Manual (CD-ROM)

13-2. Microcomputer P.C. Board

RAS-M10PKVP-E, RAS-M13PKVP-E, RAS-M16PKVP-E

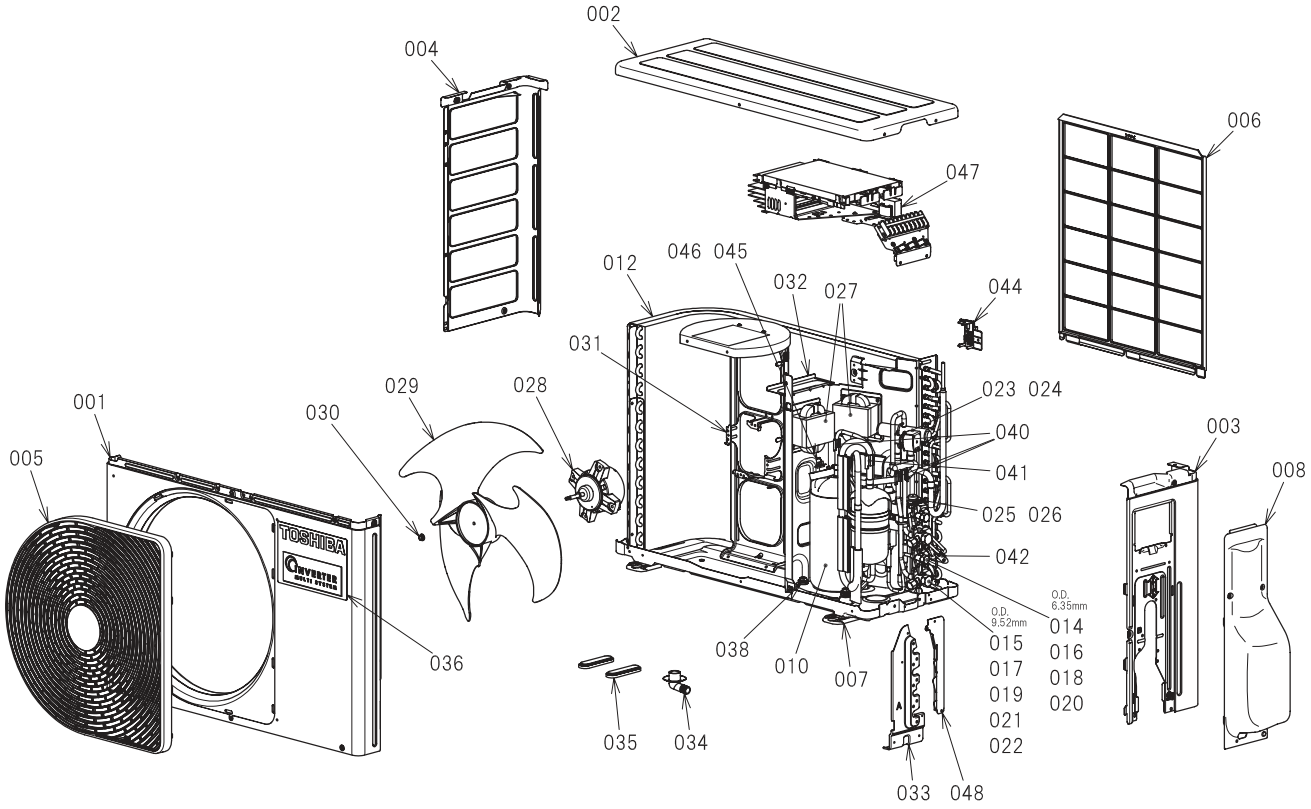


- The parts in the following parts list are conformed to RoHS.
  Therefore be sure to use the following parts for repairing and replacing.

Location No.	Part No.	Description
401	4306A132	Terminal Block, 3P
402	43050425	Sensor Ass'y, Service
403	43050426	Sensor, Service
404	4306V137	P.C. board Ass'y, WRS-LED
405	43051349	Switch Ass'y Micro
416	43067115	Clamp, Cord

Location No.	Part No.	Description
417	4306V206	P.C. board Ass'y, M10PKVP-E
418	4306V207	P.C. board Ass'y, M13PKVP-E
419	4306V208	P.C. board Ass'y, M16PKVP-E

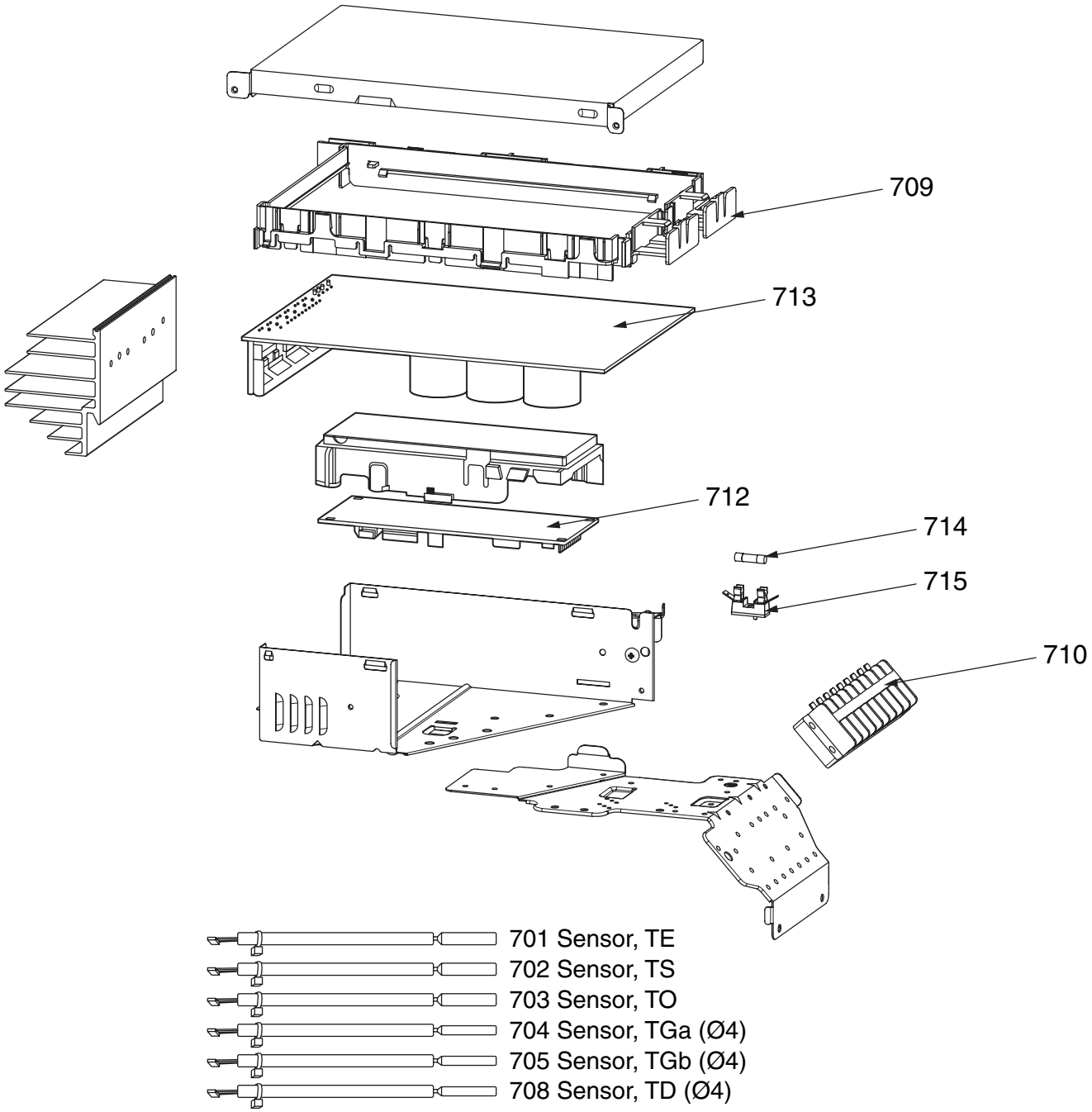
13-3. Outdoor Unit



Location No.	Part No.	Description
001	43005657	Cabinet, Front
002	43005642	Cabinet, Upper
003	43005774	Cabinet, Side, Right
004	43005634	Cabinet, Side, Left
005	4301V088	Guard, Fan
006	4301V053	Guard, Fin
007	43100346	Base Ass'y
008	4301V096	Cover, Valve, Packed
010	43041635	Compressor, DA130A1F-25F
012	43043815	Condenser Ass'y
014	37546845	Valve, Packed, 6.35
015	43046509	Valve, Packed, 9.52
016	43147196	Bonnet, 1/4 IN
017	43047401	Bonnet, 3/8 IN
018	43047676	Nut, Flare, 6.35
019	43047677	Nut, Flare, 9.52
020	43047679	Cap, Valve, Packed, 6.35
021	43049791	Cap, Valve, Packed, 9.52
022	43047674	Cap, Charge, Port
023	43046445	Valve, 4-Way, STF-0213Z
024	43146722	Coil, 4-Way, Valve
025	37546848	Valve, P.M.V., CAM-B22YGTF-3

Location No.	Part No.	Description
026	43046487	Coil, P.M.V., CAM-MD12TF-12
027	43058277	Reactor, CH-57-Z-T
028	4302C068	Motor, Fan, ICF-140-43-4R
029	43020329	Fan, Propeller, PJ421
030	43047669	Nut, Flange
031	43039394	Base, Motor
032	43004233	Plate, Partition
033	4301V115	Plate, FIx, Valve, Packed
034	43032441	Nipple, Drain
035	43089160	Cap, Waterproof
036	4301L506	Mark, TOSHIBA, IMS
038	43042485	Rubber, Cushion
040	43063321	Holder, Sensor, ø4, 8-9.52 (TD, TGa, TGb)
041	43063322	Holder, Sensor, ø6, 11.4-12.7 (TS)
042	43063325	Holder, Sensor, ø6, 6.35-8 (TE)
044	43063339	Holder, Sensor (TO)
045	43050407	Thermostat, Bimetal
046	43063317	Holder, Thermostat
047	43158192	Reactor, CH-43-Z-T
048	4301V116	Plate, Connect, Valve, Packed

13-4. P.C. Board Layout



- The parts in the following parts list are conformed to RoHS.
  Therefore be sure to use the following parts for repairing and replacing.

Location No.	Part No.	Description
701	43050422	Sensor, TE
702	43050423	Sensor, TS
703	43050427	Sensor, TO
704	43050431	Sensor, TGa
705	43050432	Sensor, TGb
708	43050430	Sensor, TD

Location No.	Part No.	Description
709	43062228	Base P.C. board
710	43160610	Terminal Block 9P (A)
712	4306V257	P.C. board Ass'y, MCC-5015
713	4306V256	P.C. board Ass'y, MCC-5009
714	43160590	Fuse
715	43160571	Fuse holder 15A 250V

This product is compliant with Directive 2002/95/EC, and cannot be disposed as unsorted municipal waste.

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